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Census of Manufactures

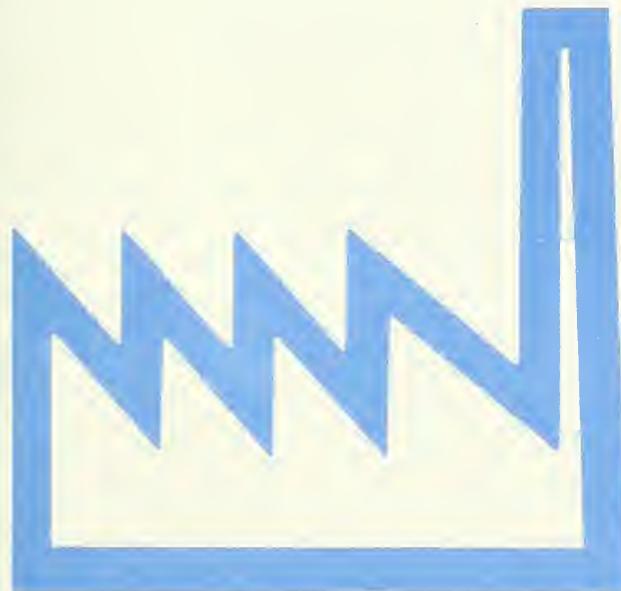
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MC87-I-28E

INDUSTRY SERIES

Paints and Allied Products

Industry 2851



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If you have any questions concerning the statistics in this report, call (301) 763-2510.

1987

Census of Manufactures

MC87-I-28E

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Paints and Allied Products

Industry 2851

Issued January 1990



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INTRODUCTION

PURPOSE AND USES OF THE ECONOMIC CENSUSES

The economic censuses are the major source of facts about the structure and functioning of the Nation's economy. They provide essential information for government, business, industry, and the general public.

Economic censuses furnish an important part of the framework for such composite measures as the gross national product, input-output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions.

Policy-making agencies of the Federal Government use the data, especially in monitoring economic activity and providing assistance to business.

State and local governments use the data to assess business activities and tax bases within their jurisdictions and to develop programs to attract business.

Trade associations study trends in their own and competing industries, and keep their members informed of market changes.

Individual businesses use the data to locate potential markets and to analyze their own production and sales performance relative to industry or area averages.

AUTHORITY AND SCOPE

Title 13 of the United States Code (sections 131, 191, and 224) directs the Census Bureau to take the economic censuses every 5 years, covering years ending in 2 and 7. The 1987 Economic Censuses consist of the

- Census of Retail Trade
- Census of Wholesale Trade
- Census of Service Industries
- Census of Transportation
- Census of Manufactures
- Census of Mineral Industries
- Census of Construction Industries

Special programs also cover enterprise statistics and minority-owned and women-owned businesses. (The 1987 Census of Agriculture and 1987 Census of Governments are conducted separately.) The next economic censuses are scheduled to be taken in 1993 covering the year 1992.

AVAILABILITY OF THE DATA

The results of each of the economic censuses are available in printed reports, for sale by the U.S. Government Printing Office, and on microfiche, computer tape, compact discs with read-only memory, and flexible diskettes, for sale by the Census Bureau. Order forms for all types of products are available on request from Customer Services, Census Bureau, Washington, DC 20233. A more complete description of publications being issued from this census is on the inside back cover of this document.

Census facts are also widely disseminated by trade associations, business journals, and newspapers. Volumes containing census statistics are available in most major public and college libraries. Finally, State Data Centers in every State and Business and Industry Data Centers in many States also supply economic census statistics.

WHAT'S NEW IN 1987

Several changes have taken place for the 1987 censuses. Data will be reported on the basis of the newly revised Standard Industrial Classification (SIC) system with selected reports including "bridge tables," linking the old and new classification systems. A new set of metropolitan areas has been adopted, and more detailed information will be available for businesses with no paid employees. For additional information on these changes, review the subsequent text.

HISTORICAL INFORMATION

The economic censuses have been taken together as an integrated program at 5-year intervals since 1967, and before that for 1963, 1958, and 1954. Prior to that time, the individual censuses were taken separately at varying intervals.

The economic censuses trace their beginnings to the 1810 Decennial Census, when questions on manufacturing were included with those for population. Coverage of economic activities was expanded for 1840 and subsequent censuses to include mining and some commercial

activities. In 1902, Congress established a permanent Census Bureau and directed that a census of manufactures be taken every 5 years. The 1905 manufactures census was the first time a census was taken apart from the regular every-10-year population census.

The first census of business was taken in 1930, covering 1929. Initially it covered retail and wholesale trade, and construction industries, but it was broadened in 1933 to include some of the service trades.

The 1954 economic censuses were the first to be fully integrated—providing comparable census data across economic sectors, using consistent time periods, concepts, definitions, classifications, and reporting units. These were the first censuses to be taken by mail, using lists of firms provided by the administrative records of other federal agencies. Since 1963, administrative records have also been used to provide basic statistics as well for very small firms, reducing or eliminating the need to send them census questionnaires. The Enterprise Statistics Program, which publishes combined data from the economic censuses, was made possible with the implementation of the integrated census program in 1954.

The range of industries covered in the economic censuses has continued to expand. The Census of Construction Industries began on a regular basis in 1967, and the scope of service industries was broadened in 1967, 1977, and 1987. The Census of Transportation began in 1963 as a set of surveys covering travel, transportation of commodities, and trucks. New for 1987 are publications reporting on business establishments engaged in several transportation industries, paralleling the data on establishments in other sectors. This is part of a gradual expansion in coverage of industries previously subjected to government regulation. The Survey of Minority-Owned Business Enterprises was first conducted as a special project in 1969 and was incorporated into the economic censuses in 1972 along with the Survey of Women-Owned Businesses.

Economic censuses have also been taken in Puerto Rico since 1909, in the Virgin Islands and Guam since 1958, and in the Northern Mariana Islands since 1982.

Statistical reports from the 1982 and earlier censuses provide historical figures for the study of long-term time series, and are available in some large libraries. All of the census data published since 1967 are still available for sale on microfiche from the Census Bureau.

AVAILABILITY OF MORE FREQUENT ECONOMIC DATA

While the censuses provide complete enumerations every 5 years, there are many needs for more frequent data as well. The Census Bureau conducts a number of monthly, quarterly, and annual surveys, the results of which appear in publication series such as *Current Business Reports* (retail and wholesale trade and service industries), the *Annual Survey of Manufactures*, *Current Industrial Reports*, and the *Quarterly Financial Report*. Most of these surveys, while providing more frequent

observations, yield less kind-of-business and geographic detail than the censuses. The *County Business Patterns* program offers annual statistics on the number of establishments, employment, and payroll classified by industry within each county.

SOURCES FOR MORE INFORMATION

More information about the scope, coverage, classification system, data items, and publications for each of the economic censuses and related surveys is published in the *Guide to the 1987 Economic Censuses and Related Statistics*. More information on the methodology, procedures, and history of the censuses will be published in the *History of the 1987 Economic Censuses*. Contact Customer Services for information on availability.

CENSUS OF MANUFACTURES

General

This report, from the 1987 Census of Manufactures, is one of a series of 83 industry reports, each of which provides statistics for individual industries or groups of related industries. Additional separate reports will be issued for each State and the District of Columbia and for special subjects such as type of organization, distribution of sales by class of customer, concentration ratios and water use in manufacturing.

The industry reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, capital expenditures, product shipments, etc.

State reports present similar statistics for each State and its important metropolitan statistical areas (MSA's), counties, and places. Selected statistical totals for "all manufacturing" have been shown in the State reports for MSA's with 250 employees or more and for counties and places with 450 employees or more.

The *General Summary* report will contain industry, product class, and geographic area statistics summarized in one report. The introduction to the *General Summary* discusses, at greater length, many of the subjects described in this introduction. For example, the *General Summary* text will discuss the relationship of value added by manufacture to National income by industry of origin, the changes in statistical concepts over the history of the censuses, and the valuation problems arising from intracompany transfers between manufacturing plants of a company and between manufacturing plants and sales offices and sales branches of a company.

Scope of Census and Definition of Manufacturing

The 1987 Census of Manufactures covers all establishments with one paid employee or more primarily engaged in manufacturing as defined in the *1987 Standard Industrial*

*Classification (SIC) Manual*¹. This is the system of industrial classification developed by experts on classification in Government and private industry under the guidance of the Office of Information and Regulatory Affairs, Office of Management and Budget. This classification system is used by Government agencies as well as many organizations outside the Government.

The SIC Manual defines manufacturing as the mechanical or chemical transformation of substances or materials into new products. The assembly of component parts of products also is considered to be manufacturing if the resulting product is neither a structure nor other fixed improvement. These activities are usually carried on in plants, factories, or mills that characteristically use power-driven machines and materials-handling equipment.

Manufacturing production is usually carried on for the wholesale market, for transfers to other plants of the same company, or to the order of industrial users rather than for direct sale to the household consumer. Some manufacturers in a few industries sell chiefly at retail to household consumers through the mail, through house-to-house routes, or through salespersons. Some activities of a service nature (enameling, engraving, etc.) are included in manufacturing when they are performed primarily for trade. They are considered nonmanufacturing when they are performed primarily to the order of the household consumer.

Relationship Between Annual Survey of Manufactures and Census of Manufactures

The Bureau of the Census conducts the annual survey of manufactures (ASM) in each of the 4 years between the censuses of manufactures. The ASM is a probability-based sample of approximately 56,000 establishments and collects the same industry statistics (employment, payroll, value of shipments, etc.) as the census of manufactures. In addition to collecting the information normally requested on the census form, the establishments in the ASM sample are requested to supply information on assets, capital expenditures, retirements, depreciation, rental payments, supplemental labor costs, costs of purchased services, and foreign content of materials consumed. Except for supplemental labor costs, the extra ASM items are collected only in census years.

Establishment Basis of Reporting

The census of manufactures is conducted on an establishment basis. A company operating at more than one location is required to file a separate report for each location. The ASM also is conducted on an establishment basis, but separate reports are filed for just those establishments selected in the sample. Companies engaged in

distinctly different lines of activity at one location are requested to submit separate reports if the plant records permit such a separation and if the activities are substantial in size.

In 1987, as in earlier years, a minimum size limit was set for inclusion of establishments in the census. All establishments employing one person or more at any time during the census year are included. The same size limitation has applied since 1947 in censuses and annual surveys of manufactures. In the 1939 and earlier censuses, establishments with less than \$5,000 value of products were excluded. The change in the minimum size limit in 1947 does not appreciably affect the historical comparability of the census figures except for data on number of establishments for a few industries. This report excludes information for separately operated administrative offices, warehouses, garages, and other auxiliary units that service manufacturing establishments of the same company (see Auxiliaries).

Manufacturing Universe and Census Report Forms

The 1987 Census of Manufactures universe includes approximately 350,000 establishments. The amounts of information requested from manufacturing establishments were dependent upon a number of factors. The more important considerations were the size of the company and whether it was included in the annual survey of manufactures. The methods of obtaining information for the various subsets of the universe to arrive at the aggregate figures shown in the publication are described below:

1. Small Single-Establishment Companies Not Sent a Report Form

In the 1987 Census of Manufactures, approximately 150,000 small single-establishment companies were excused from filing reports. Selection of these small establishments was done on an industry-by-industry basis and was based on annual payroll and total shipments data as well as on the industry classification codes contained in the administrative records of Federal agencies. The cutoffs were selected so that these administrative-records cases would account for no more than 3 percent of the value of shipments for all manufacturing. Generally, all single-establishment companies with less than five employees were excused, while all establishments with more than 20 employees were mailed forms.

Information on the physical location of the establishment, as well as information on payrolls, receipts (shipments), and industry classification, was obtained from the administrative records of other Federal agencies under special arrangements, which safeguarded their confidentiality. Estimates of data for these small establishments were developed using industry averages in conjunction with the administrative information. The value of shipments and cost of materials

¹Standard Industrial Classification Manual: 1987: For sale by Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, Stock No. 041-001-00314-2.

were not distributed among specific products and materials for these establishments but were included in the product and material "not specified by kind" (n.s.k.) categories.

The industry classification codes included in the administrative-records files were assigned on the basis of brief descriptions of the general activity of the establishment. As a result, an indeterminate number of establishments were erroneously coded at the four-digit SIC level. This was especially true whenever there was a relatively fine line of demarcation between industries or between manufacturing and nonmanufacturing activity.

Sometimes these administrative-record cases were only given a two- or three-digit SIC group. For the 1987 Census of Manufactures, these establishments were sent a separate classification form, which requested information on the products and services of the establishment. This form was used to code many of these establishments to the four-digit SIC level. Establishments that did not return the classification form were coded later to those four-digit SIC industries identified as "not elsewhere classified" (n.e.c.) within the given two- or three-digit industry groups.

As a result of these situations, a number of small establishments may have been misclassified by industry. However, such possible misclassification has no significant effect on the statistics other than on the number of companies and establishments.

The total establishment count for individual industries should be viewed as an approximation rather than a precise measurement. The counts for establishments with 20 employees or more are far more reliable than the count of total number of establishments.

2. Establishments Sent a Report Form

The 200,000 establishments covered in the mail canvass were divided into three groups:

a. **ASM sample establishments**—This group consisted of approximately 56,000 establishments covering all the units of large manufacturing establishments as well as a sample of the medium and smaller establishments. The probability of selection was proportionate to size (see appendix, Annual Survey of Manufactures).

In a census of manufactures year, the ASM report form (MA-1000) replaces the first page of the regular census form for those establishments included in the ASM. In addition to information on employment, payroll, and other items normally requested on the regular census form, establishments in the ASM sample were requested to supply information on assets, capital expenditures, retirements, depreciation, rental payments, supplemental labor costs, and costs of purchased services. See appendix A, section 2, for an explanation of these items.

The census part of the report form is one of approximately 200 versions containing product, material, and special inquiries. The diversity of manufacturing activities necessitated the use of these many forms to canvass the 459 manufacturing industries. Each form was developed for a group of related industries.

Appearing on each form was a list of products primary to the group of related industries as well as secondary products and miscellaneous services that establishments classified in these industries were likely to be performing. Respondents were requested to identify the products, the value of each product, and, in a large number of cases, the quantity of the product shipped during the survey year. Space also was provided for the respondent to describe products not specifically identified on the form.

The report form also contained a materials-consumed inquiry, which varied from form to form depending on the industries being canvassed. The respondents were asked to review a list of materials generally used in their production processes. From this list, each establishment was requested to identify those materials consumed during the survey year, the cost of each, and, in certain cases, the quantity consumed. Once again, space was provided for the respondent to describe significant material not identified on the form.

Finally, a wide variety of special inquiries was included to measure activities peculiar to a given industry, such as operations performed and equipment used.

- b. **Large and medium establishments (non-ASM)**—Approximately 84,000 establishments were included in this group. A variable cutoff, based on administrative-records payroll data and determined on an industry-by-industry basis, was used to select those establishments that were to receive one of the approximately 200 census of manufactures regular forms. The first page, requesting establishment data for items such as employment and payroll, was standard but did not contain the detailed statistics included on the ASM form. The product, material, and special inquiry sections supplied were based on the historical industry classification of the establishment.
- c. **Small single-establishment companies (non-ASM)**—This group consisted of approximately 60,000 establishments. For those industries where application of the variable cutoff for administrative-records cases resulted in a large number of small establishments being included in the mail canvass, an abbreviated or "short" form was used. These establishments received one of the approximately 80 versions of the short form, which requested

summary product and material data and totals but no details on employment, payrolls, cost of materials, inventories, and capital expenditures.

Use of the short form has no adverse effect on published totals for the industry statistics; the same data were collected on the short form as on the long form. However, detailed information on materials consumed was not collected on the short form; thus its use would increase the value of the n.s.k. categories.

Auxiliaries

In this industry report, the data on employment and payroll are limited to operating manufacturing establishments. The census report form filed for auxiliaries (ES-9200) requested a description of the activity of the establishments serviced. However, the manufacturing auxiliaries were coded only to the two-digit major group of the establishments they served; whereas, the operating establishments were coded to a four-digit manufacturing industry. Data for the approximately 10,000 separately operated auxiliaries are included in the geographic area series and in a report issued as part of the 1987 Enterprise Statistics Survey.

Auxiliaries are establishments whose employees are primarily engaged in performing supporting services for other establishments of the same company, rather than for the general public or for other business firms. They can be at different locations from the establishments served or at the same location as one of those establishments but not operating as an integral part thereof and serving two establishments or more. Where auxiliary operations are conducted at the same location as the manufacturing operation and operate as an integral part thereof, they usually are included in the report for the operating manufacturing establishment.

Included in the broad category of auxiliaries are administrative offices. Employees in administrative offices are concerned with the general management of multistablishment companies, i.e., with the general supervision and control of two units or more, such as manufacturing plants, mines, sales branches, or stores. The functions of these employees may include (1) program planning, including sales research and coordination of purchasing, production, and distribution; (2) company purchasing, including general contracts and purchasing methods; (3) company financial policy and accounting; (4) general engineering, including design of product machinery and equipment, and direction of engineering effort conducted at the individual operation locations; (5) direction of company personnel matters; and (6) legal and patent matters.

Other types of auxiliaries serving the plants or central management of the company include purchasing offices, sales promotion offices, research and development organizations, etc.

Industry Classification of Establishments

Each of the establishments covered in the census was classified in 1 of 459 manufacturing industries in accordance with the industry definitions in the 1987 SIC Manual. The 1987 edition of this manual represents a major revision for manufacturing industries from the 1972 edition and its 1977 supplement. Appendix A of the 1987 Manual notes the revisions in the four-digit industry levels between 1972/77 and 1987.

An industry is generally defined as a group of establishments producing the same product or a closely related group of products. The product groupings from which industry classifications are derived are based on considerations such as similarity of manufacturing processes, types of materials used, types of customers, and the like. The resulting group of establishments must be significant in terms of number, value added by manufacture, value of shipments, and number of employees. The system operates in such a way that the definitions progressively become narrower with successive additions of numerical digits. For 1987, there are 20 major groups (two-digit SIC), 139 industry groups (three-digit SIC), and 459 industries (four-digit SIC). This represents an expansion of four-digit industries from 452 in 1972/77 and a reduction of three-digit groups from 143 in 1972/77. Product classes and products of the manufacturing industries have been assigned codes based on the industry from which they originate. There are about 11,000 products identified by a seven-digit code. The seven-digit products are considered the primary products of the industry with the same four digits.

Accordingly, an establishment is usually classified in a particular industry on the basis of its major activity during a particular year, i.e., production of the products primary to that industry exceeds, in value, production of the products primary to any other single industry. In a few instances, however, the industry classification of an establishment is not only determined by the products it makes but also by the process employed in operations. Refining of nonferrous metals from ore or rolling and drawing of nonferrous metals (processes which involve heavy capitalization in specialized equipment) would be classified according to the process used during a census year. These establishments then would be "frozen" in that industry during the following ASM years.

In either a census or ASM year, establishments included in the ASM sample with certainty weight, other than those involved with heavily capitalized activities described above, are reclassified by industry only if the change in the primary activity from the prior year is significant or the change has occurred for 2 successive years. This procedure prevents reclassification when there are minor shifts in product mix.

In ASM years, establishments included in the ASM sample with noncertainty weight are not shifted from one industry classification to another. They are retained in the industry where they were classified in the base census year (see appendix, Annual Survey of Manufactures).

However, in the following census year, these ASM plants are allowed to shift from one industry to another.

The result of these rules covering the switching of plants from one industry classification to another is that, at the aggregate level, some industries comprise different mixes of establishments between survey years, and establishment data for such industry statistics as employment and payroll may be tabulated in different industries between survey years. Hence, comparisons between prior-year and current-year published totals, particularly at the four-digit SIC level, should be viewed with caution. This is particularly true for the comparison between the data shown for a census year versus the data shown for the previous ASM year.

As previously noted, the small establishments that may have been misclassified by industry are usually administrative-record cases whose industry codes were assigned on the basis of incomplete descriptions of the general activity of the establishment. Such possible misclassifications have no significant effect on the statistics other than on the number of companies and establishments.

While some establishments produce only the primary products of the industry in which they are classified, all establishments of an industry rarely specialize to this extent. The industry statistics (employment, inventories, value added by manufacture, total value of shipments including resales and miscellaneous receipts, etc.) shown in tables 1a through 5a, therefore, reflect not only the primary activities of the establishments in that industry but also their secondary activities. The product statistics in table 6a represent the output of all establishments whether or not they are classified in the same industry as the product. For this reason, in relating the industry statistics, especially the value of shipments to the product statistics, the composition of the industry's output shown in table 5b should be considered.

The extent to which industry and product statistics may be matched with each other is measured by two ratios which are computed from the figures shown in table 5b. The first of these ratios, called the primary product specialization ratio, measures the proportion of product shipments (both primary and secondary) of the establishments classified in the industry represented by the primary products of those establishments. The second ratio, called the coverage ratio, is the proportion of primary products shipped by the establishments classified in the industry to total shipments of such products by all manufacturing establishments.

However, establishments making products falling into the same industry category may use a variety of processes and materials to produce them. Also, the same industry classification (based on end products) may include both establishments that are highly integrated and those that put only the finishing touches on an already highly fabricated item. For example, the refrigeration equipment industry includes instances of almost complete integration (production of the compressor, condensing unit, electric motor, casting, stamping of the case, and final assembly) all

carried on at one plant. On the other hand, the condensing unit, the motor, and the case may be purchased and only assembled into the finished product.

In some instances, separate industry categories have been established for integrated and nonintegrated establishments. For other industries, the census provides separate statistics on the production of intermediate commodities made and used in the producing plant. For some industries characterized by many plants of the same company, separate figures on interplant transfers of products usually are shown.

Differences in the integration of production processes, types of operations, and alternatives in types of materials used should be considered when relating the industry statistics (employment, payrolls, value added, etc.) to the product and material data.

Value of Shipments for the Industry Compared With Value of Product Shipments

This report shows value of shipments data for industries and products. In tables 1a through 5a, these data represent the total value of shipments of all establishments classified in a particular industry. The data include the shipments of the products classified in the industry (primary to the industry), products classified in other industries (secondary to the industry), and miscellaneous receipts (repair work, sale of scrap, research and development, installation receipts, and resales). Value of product shipments shown in table 6a represents the total value of all products shipped that are classified as primary to an industry.

CENSUS DISCLOSURE RULES

In accordance with Federal law governing census reports, no data are published that would disclose the data for an individual establishment or company. However, the number of establishments classified in a specific industry is not considered a disclosure, so this information may be released even though other information is withheld.

The disclosure analysis for the industry statistics in tables 1a through 5a of this report is based on the total value of shipments. When the total value of shipments cannot be shown without disclosing information for individual companies, the complete line is suppressed. However, the suppressed data are included in higher-level totals. Additional disclosure analysis is performed for new capital expenditures that can be suppressed even though value of shipments data are publishable.

SPECIAL TABULATIONS

Special tabulations of data collected in the 1987 Census of Manufactures may be obtained on computer tape or in tabular form. The data will be in summary form and subject to the same rules prohibiting disclosure of confidential

information (including name, address, kind of business, or other data for individual business establishments or companies) as are the regular publications.

Special tabulations are prepared on a cost basis. A request for a cost estimate, as well as exact specifications on the type and format of the data to be provided, should be directed to the Chief, Industry Division, Bureau of the Census, Washington, DC 20233.

ABBREVIATIONS AND SYMBOLS

The following abbreviations and symbols are used in this publication:

-	Represents zero.
(D)	Withheld to avoid disclosing data for individual companies; data are included in higher level totals.
(NA)	Not available.
(NC)	Not comparable.
(S)	Withheld because estimate did not meet publication standards.
(X)	Not applicable.
(Z)	Less than half the unit shown.
do	Ditto.

n.e.c.	Not elsewhere classified.
n.s.k.	Not specified by kind.
pt.	Part.
r	Revised.

SIC Standard Industrial Classification.

Other abbreviations, such as lb, gal, yd, doz, bbl, and tons, are used in the customary sense.

CONTACTS FOR DATA USERS

Subject Area	Contact	Phone
Census/ASM		
Durables	Kenneth Hansen	(301) 763-7304
Nondurables	Michael Zampogna	(301) 763-2510
Current Industrial Reports		
Durables	Malcolm Bernhardt	(301) 763-2518
Nondurables	Thomas Flood	(301) 763-5911
Import/Export Publications		
Industry Analysis and Forecasts	Foreign Trade Division	(301) 763-5140
Industry Analysis and Forecasts	International Trade Administration	(202) 377-4356

Users' Guide for Locating Statistics in This Report by Table Number

For explanation of terms, see appendixes

Item	Four-digit industry statistics							Five-digit product class and seven-digit product statistics			
	Historical	Operat-ing ratios	By geo-graphic area	Sum-mary and supple-mental	By employ-ment size	By industry and product class special-ization	Materials con-sumed by kind	Industry-product analysis	Product ship-ments	Product class by geo-graphic area	Historical product class
Number of companies	1a			3a					*6a		
Number of establishments....	1a		2	3a	4	5a					
Employment and payroll:.....											
Number of employees	1a	1b	2	3a	4	5a					
Payroll	1a	1b	2	3a	4	5a					
Supplemental labor costs				3a							
Production workers.....	1a	1b	2	3a	4	5a					
Production-worker hours....	1a	1b	2	3a	4	5a					
Production-worker wages....	1a	1b	2	3a	4	5a					
Shipments, cost of materials, and value added:											
Value of shipments (four-digit)	1a	1b	2	3a	4	5a		5b			
Product class shipments (five-digits)	1a	1b	2	3a	4	5a			6a	6b	6c
Product shipments (seven-digit)									6a		
Value added by manufacturer	1a	1b	2	3a	4	5a					
Cost of materials.....	1a	1b	2	3a	4	5a					
Fuels and electric energy ...				3a							
Materials consumed by kind.				3a				7			
Inventories:											
Total, end of year	1a			3a	4						
By stage of fabrication.....				3a							
Capital expenditures, assets, rental payments, and purchased services:											
New capital expenditures....	1a		2	3b	4	5a					
Used plant and equipment expenditures.....				3b							
Gross assets				3b							
Depreciation.....				3b							
Retirements of buildings and machinery				3b							
Rental payments				3b							
Foreign content of materials consumed.....				3c							
Purchased services.....				3c							
Ratios:											
Specialization.....	1a			3a				5b			
Coverage.....	1a			3a				5b			

*Number of companies with shipments of more than \$100 thousand.

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Paints and Allied Products

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DESCRIPTION OF INDUSTRIES AND SUMMARY OF FINDINGS

This report shows 1987 Census of Manufactures statistics for establishments classified in the following industry:

SIC CODE AND TITLE

2851 Paints and Allied Products

The industry statistics (employment, payroll, cost of materials, value of shipments, inventories, etc.) are reported for each establishment as a whole. Aggregates of such data for an industry reflect not only the primary activities of the establishments but also their activities in the manufacture of secondary products as well as their miscellaneous activities (contract work on materials owned by others, repair work, etc.). This fact should be taken into account when comparing industry statistics (tables 1 through 5a) with product statistics (table 6) showing shipments by all industries of the primary products of the specified industry. The extent of the "product mix" is indicated in table 5b, which shows the value of primary and secondary products shipped by establishments classified in the specified industry and the value of primary products of the industry shipped as secondary products by establishments classified in other industries.

Small single-establishment companies with up to 20 employees (cutoff varied by industry) were excluded from the mail portion of the census. For these establishments (and a small number of larger establishments whose reports were not received at the time the data were tabulated), data on payrolls and receipts were obtained from administrative records of other Federal agencies. The remaining statistics were developed from industry averages.

Establishment data were tabulated based on industry definitions included in the 1987 Standard Industrial Classification (SIC) Manual¹. The 1987 edition represents a major revision for manufacturing industries from the 1972 edition and its 1977 supplement. In addition to the 1987 SIC revision, changes were made to the product class (five-digit) and product code (seven-digit) categories. The product class and product code comparability between the 1987 and 1982 censuses is shown in the appendixes. These appendixes present, in tabular form, the linkage from 1987 to 1982.

All dollar figures included in this report are at prices current for the year specified and, therefore, unadjusted for changes in price levels. Consequently, when making comparisons to prior years, users should take into consideration the inflation that has occurred.

INDUSTRY 2851, PAINTS AND ALLIED PRODUCTS

This industry is made up of establishments primarily engaged in the manufacture of paints (in paste and ready-mixed form), varnishes, lacquers, enamels and shellacs, putties, wood fillers and sealers, paint and varnish removers, paint brush cleaners, and allied paint products. Establishments primarily engaged in the manufacture of carbon black are classified in Industry 2895, Carbon Black; bone black, lamp black, and inorganic pigments in Industry 2816, Inorganic Pigments; organic color pigments in Industry 2865, Cyclic Crudes and Intermediates; plastics materials in Industry 2821, Plastics Materials and Resins; printing ink in Industry 2893, Printing Ink; caulking compounds and sealants in Industry 2891, Adhesives and Sealants; artists' paints in Industry 3952, Lead Pencils and Art Goods; and turpentine in Industry 2861, Gum and Wood Chemicals.

Products of this industry also are collected in the Current Industrial Report MA-28F, Paint, Varnish, and Lacquer.

The 1987 definition of this industry is the same as that used in the 1972/7 Standard Industrial Classification (SIC) system. The SIC number and title also are the same.

In the 1987 Census of Manufactures, Industry 2851, Paints and Allied Products, had employment of 55.2 thousand. The employment figure was 2 percent above the 54.1 thousand reported in 1982. Compared with 1986, employment decreased 1 percent. The 1986 data are based on the Bureau's annual survey of manufactures (ASM), which is a sample survey conducted each year between censuses. The leading States in employment in 1987 were Ohio, California, Illinois, and New Jersey, accounting for 40 percent of the industry's employment. These same States were the leaders in 1982, when they also accounted for 40 percent of the industry's employment.

The total value of shipments for establishments classified in this industry was \$12.7 billion.

Establishments in virtually all industries ship secondary products as well as products primary to the industry to which they are classified and have some miscellaneous

¹Standard Industrial Classification Manual: 1987. For sale by Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. Stock No. 041-001-00314-2.

receipts, such as resales and contract receipts. Industry 2851 shipped \$11.7 billion of products considered primary to the industry, \$240.1 million of secondary products, and had \$732.8 million of miscellaneous receipts, resales, and contract work. Thus, the ratio of primary products to the total of both secondary and primary products shipped by establishments in the industry was 98 percent (specialization ratio). In 1982, the specialization ratio was 97 percent.

Establishments in this industry also accounted for 97 percent of products considered primary to the industry no matter where they actually were produced (coverage ratio). In 1982, the coverage ratio was 96 percent. The products primary to industry 2851, no matter in what industry they were produced, appear in table 6a and aggregate to \$12.1 billion. For further explanation of specialization and coverage ratios, see table 5b and the appendixes.

The total cost of materials, services, and fuels and electric energy used by establishments classified in the paints and allied products industry amounted to \$6.5 billion. Data on specific materials consumed appear in table 7.

Single-establishment companies in this industry with up to 10 employees were excluded from the mail portion of the census. The data for these establishments (and a small number of larger establishments whose reports were not received at the time the data were tabulated) were obtained from administrative records of other agencies or developed from industry averages. These establishments accounted for 11 percent of total value of shipments.

Table 1a. Historical Statistics for the Industry: 1987 and Earlier Years

[1987 industry definitions are the same as in the 1972/77 Standard Industrial Classification (SIC) system. Excludes data for auxiliaries. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendices]

Year ¹	All establishments ³		All employees		Production workers			Value added by manufacture ⁴ (million dollars)	Cost of materials ⁵ (million dollars)	Value of shipments (million dollars)	New capital expenditures ⁶ (million dollars)	End-of-year inventories ⁴ (million dollars)	Ratios		
	Companie ^s (no.)	Total (no.)	With 20 employees or more (no.)	Number (1,000)	Payroll (million dollars)	Number (1,000)	Hours (millions)						Speci- cial- ization ⁷ (per- cent)	Cover- age ⁸ (per- cent)	
INDUSTRY 2851, PAINTS AND ALLIED PRODUCTS															
1987 Census	1 123	1 426	626	55.2	1 491.3	28.3	56.3	628.0	6 220.5	6 508.9	12 701.2	275.0	1 548.7	98	97
1986 ASM	(NA)	(NA)	(NA)	55.8	1 416.3	28.8	57.0	611.4	5 407.2	6 302.6	11 724.9	254.2	1 494.9	(NA)	(NA)
1985 ASM	(NA)	(NA)	(NA)	55.5	1 359.5	29.0	56.9	596.5	5 169.3	6 396.8	11 562.4	248.8	1 555.4	(NA)	(NA)
1984 ASM	(NA)	(NA)	(NA)	55.3	1 286.8	29.1	56.9	564.4	4 932.1	6 011.3	10 848.4	283.6	1 461.9	(NA)	(NA)
1983 ASM	(NA)	(NA)	(NA)	53.6	1 207.7	27.5	54.1	504.4	4 706.3	5 577.3	10 194.6	280.1	1 375.3	(NA)	(NA)
1982 Census	1 170	1 441	620	54.1	1 157.7	27.6	53.6	481.1	3 952.5	5 167.6	9 162.1	219.2	1 231.5	97	96
1981 ASM	(NA)	(NA)	(NA)	60.1	1 167.0	31.5	61.8	494.5	3 867.3	5 350.8	9 143.5	230.6	1 170.2	(NA)	(NA)
1980 ASM	(NA)	(NA)	(NA)	62.3	1 081.7	32.7	63.4	463.3	3 559.2	4 793.8	8 340.0	205.4	1 068.3	(NA)	(NA)
1979 ASM	(NA)	(NA)	(NA)	63.1	1 024.5	34.8	68.1	466.2	3 363.6	4 610.7	7 910.5	187.2	1 055.5	(NA)	(NA)
1978 ASM	(NA)	(NA)	(NA)	61.5	943.4	32.9	65.6	426.9	2 954.6	4 197.1	7 167.4	174.6	944.3	(NA)	(NA)
1977 Census	1 288	1 579	653	61.4	882.6	33.0	66.2	394.1	2 821.3	3 848.9	6 629.7	167.4	937.6	96	97
1976 ASM	(NA)	(NA)	(NA)	60.4	810.2	31.9	63.9	353.0	2 562.2	3 437.5	5 931.3	122.4	849.2	(NA)	(NA)
1975 ASM	(NA)	(NA)	(NA)	59.9	736.9	31.1	61.3	315.7	2 126.3	3 003.2	5 149.9	121.6	755.8	(NA)	(NA)
1974 ASM	(NA)	(NA)	(NA)	64.9	741.9	35.0	69.5	337.1	2 227.6	2 890.5	5 007.0	119.1	841.2	(NA)	(NA)
1973 ASM	(NA)	(NA)	(NA)	69.3	718.4	39.1	75.4	329.0	1 959.8	2 330.4	4 268.3	72.5	624.9	(NA)	(NA)
1972 Census	1 317	1 599	687	65.9	647.2	36.2	73.2	295.1	1 791.7	2 058.4	3 821.8	81.5	542.8	95	96

¹In annual survey of manufactures (ASM) years, data are estimates based on a representative sample of establishments canvassed annually and may differ from results of a complete canvass of all establishments. ASM publication shows percentage standard errors. Unless otherwise noted, for data prior to 1972, see 1972 Census of Manufactures, vol. II, table 1a of the Industry chapter.

²For the Census, a company is defined as a business organization consisting of one establishment or more under common ownership or control.

³Includes establishments with payroll at any time during year.

⁴Beginning with the 1982 Census of Manufactures, all respondents were requested to report their inventories at (the lower of) cost or market prior to adjustment to LIFO cost. This is a change from prior Censuses and annual surveys of manufactures in which respondents were permitted to value their inventories using any generally accepted accounting method. Consequently, inventories and values added by manufacture are not comparable to prior-year data.

⁵Detailed data on materials consumed by type are shown in table 7.

⁶Detailed data on new machinery and equipment expenditures are provided in table 3c.

⁷Represents ratio of primary product shipments to total product shipments (primary and secondary, excluding miscellaneous receipts) for establishments classified in the industry.

⁸Represents ratio of primary products shipped by establishments classified in industry to total shipments of such products by all manufacturing establishments, wherever classified.

Table 1b. Selected Operating Ratios for the Industry: 1987 and Earlier Years

[1987 industry definitions are the same as in the 1972/77 Standard Industrial Classification (SIC) system. Excludes data for auxiliaries. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendices]

Year	Payroll per employee (dollars)	Production workers as percent of total employment (percent)	Annual hours of production workers (number)	Average hourly earnings of production workers (dollars)	Cost of materials as percent of value of shipments (percent)	Cost of materials and payroll as percent of value of shipments (percent)	Value added per employee (dollars)	Payroll as percent of value added (percent)	Value added per production worker hour (dollars)
INDUSTRY 2851, PAINTS AND ALLIED PRODUCTS									
1987 Census	27 016	51	1 989	11.15	51	63	112 690	24	110.49
1986 ASM	25 381	52	1 979	10.73	54	66	96 903	26	94.86
1985 ASM	24 495	52	1 962	10.48	55	67	93 141	26	90.85
1984 ASM	23 269	53	1 955	9.92	55	67	89 188	26	86.68
1983 ASM	22 531	51	1 967	9.32	55	67	87 804	26	86.99
1982 Census	21 399	51	1 942	8.98	56	69	73 059	29	73.74
1981 ASM	19 417	52	1 962	8.00	59	71	64 348	30	62.58
1980 ASM	17 362	52	1 939	7.31	57	70	57 130	30	56.14
1979 ASM	16 236	55	1 957	6.85	58	71	53 306	30	49.39
1978 ASM	15 339	53	1 994	6.51	59	72	48 042	32	45.04
1977 Census	14 374	54	2 006	5.95	58	71	45 950	31	42.62
1976 ASM	13 413	53	2 003	5.52	58	72	42 421	32	40.10
1975 ASM	12 302	52	1 971	5.15	58	73	35 497	35	34.69
1974 ASM	11 431	54	1 986	4.85	58	73	34 324	33	32.05
1973 ASM	10 366	56	1 928	4.36	55	71	28 280	37	25.99
1972 Census	9 820	55	2 022	4.03	54	71	27 188	36	24.48

Note: For qualifications of data, see footnotes on table 1a.

Table 2. Industry Statistics for Selected States: 1987 and 1982

[Excludes data for auxiliaries. Includes data for States with 150 employees or more. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Industry and geographic area	1987											1982	
	All establishments		All employees		Production workers			Value added by manufacture	Cost of materials (million dollars)	Value of shipments (million dollars)	New capital expenditures (million dollars)	All employees ² (1,000)	Value added by manufacture (million dollars)
	E1	Total (no.)	With 20 employees or more (no.)	Number ² (1,000)	Payroll (million dollars)	Number (1,000)	Hours (millions)						
INDUSTRY 2851, PAINTS AND ALLIED PRODUCTS													
United States -----	E1	1 426	626	55.2	1 491.3	28.3	56.3	628.0	6 220.5	6 508.9	12 701.2	275.0	54.1
Alabama -----	-	15	9	.5	16.7	.3	.6	6.3	49.5	72.0	120.4	(D)	.5
Arkansas -----	-	4	3	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	AA	26.2
California -----	E1	201	77	6.4	177.6	3.2	6.5	72.3	748.1	787.4	1 523.4	27.1	6.5
Colorado -----	E1	12	5	.4	8.0	.2	.4	3.7	23.1	47.2	70.3	(D)	19.4
Connecticut -----	-	15	7	.4	13.8	.1	.3	3.2	43.1	39.5	80.3	1.9	.4
Florida -----	E1	80	21	1.6	34.8	.7	1.4	13.3	135.9	142.7	278.0	3.9	1.5
Georgia -----	-	43	21	1.7	41.4	.9	1.8	19.8	196.0	274.7	486.1	11.9	1.6
Illinois -----	-	118	66	5.4	156.1	2.9	5.9	67.9	620.8	692.4	1 294.2	(D)	408.0
Indiana -----	E1	36	16	EE	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	59.2
Iowa -----	-	12	6	.5	14.4	.4	.8	9.3	57.9	83.4	143.3	.6	CC
Kansas -----	E2	11	4	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Kentucky -----	E2	26	19	1.4	38.7	.7	1.4	16.8	300.9	199.0	500.5	3.5	1.4
Maryland -----	-	21	13	1.2	29.2	.7	1.5	13.8	223.6	211.2	432.4	7.7	1.2
Massachusetts -----	E2	41	20	1.2	35.1	.6	1.2	13.3	134.2	113.2	248.0	(D)	109.5
Michigan -----	-	66	28	3.2	102.6	1.8	3.3	49.0	445.4	387.7	838.9	(D)	235.9
Minnesota -----	E1	20	8	.8	24.5	.2	.4	5.2	59.9	58.1	119.9	(D)	.5
Mississippi -----	E1	8	3	.2	4.9	.1	.1	1.0	12.2	13.7	26.0	(D)	.2
Missouri -----	E1	61	22	2.1	50.3	1.0	2.0	21.6	214.2	213.0	424.9	4.8	2.2
New Jersey -----	-	102	51	3.5	94.7	2.0	4.0	44.8	363.3	390.4	751.2	(D)	282.8
New York -----	E2	79	27	EE	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	119.8
North Carolina -----	-	27	16	EE	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	86.7
Ohio -----	-	81	46	6.6	187.5	3.0	6.1	72.6	757.1	857.2	1 606.6	64.3	5.0
Oklahoma -----	E4	12	5	.2	5.0	.1	.3	2.5	11.7	14.1	25.8	.3	14.9
Oregon -----	E3	20	7	.5	14.1	.3	.6	5.4	47.1	58.4	104.8	2.1	.4
Pennsylvania -----	-	57	28	3.2	88.9	1.6	3.2	39.2	290.9	335.8	631.1	12.1	3.2
Rhode Island -----	E3	9	2	.2	7.3	.1	.1	1.3	17.8	16.3	34.2	(D)	(NA)
South Carolina -----	E2	8	4	BB	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	2.4
Tennessee -----	E2	29	9	.9	20.7	.6	1.1	9.9	61.3	113.3	175.4	5.0	.7
Texas -----	E1	90	40	3.1	75.7	1.6	3.2	34.5	379.9	429.6	812.2	(D)	3.5
Vermont -----	-	2	2	AA	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(NA)	294.4
Virginia -----	-	18	10	1.0	24.7	.5	1.1	12.3	173.6	95.1	266.5	5.4	CC
Washington -----	E2	24	7	.5	13.1	.2	.4	4.0	46.5	39.8	85.9	1.7	.6
Wisconsin -----	-	38	12	1.3	34.7	.7	1.3	13.3	145.3	163.4	310.6	6.4	1.2

Note: For qualifications of data, see footnotes on table 1a.

¹Payroll and sales data for some small single unit companies with up to 20 employees (cutoff varied by industry) were obtained from administrative records of other Government agencies rather than from census report forms. These data were then used in conjunction with industry averages to estimate the items shown for these small establishments. This technique was also used for a small number of other establishments whose reports were not received at the time data were tabulated. The following symbols are shown for those States where estimated value of shipments data based on administrative-record data account for 10 percent or more of figure shown: E1—10 to 19 percent; E2—20 to 29 percent; E3—30 to 39 percent; E4—40 to 49 percent; E5—50 to 59 percent; E6—60 to 69 percent; E7—70 to 79 percent; E8—80 to 89 percent; E9—90 percent or more.

²Statistics for some producing States have been withheld to avoid disclosing data for individual companies. However, for States with 150 employees or more, number of establishments is shown and employment-size range is indicated by one of the following symbols: AA—150 to 249 employees; BB—250 to 499 employees; CC—500 to 999 employees; EE—1,000 to 2,499 employees; FF—2,500 employees or more.

Table 3a. Summary Statistics for the Industry: 1987

[For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Item	Paints and allied products (SIC 2851)	Item	Paints and allied products (SIC 2851)
Companies -----	number	1 123	Production workers—Con.
All establishments -----	do	1 426	Hours—Con.
With 1 to 19 employees -----	do	800	January to March
With 20 to 99 employees -----	do	497	April to June
With 100 employees or more -----	do	129	July to September
October to December	do		13.8
Employment and labor costs:			
Employees -----	1,000	55.2	Wages
Compensation, total -----	mil dol.	1 815.9	mil dol.
Annual payroll -----	do	324.6	628.0
Fringe benefits -----	do	138.4	
Social Security and other legally required payments -----	do	186.2	Value added by manufacture
Employer payments and other programs -----	do		6 220.5
Production workers:			
Average for year -----	1,000	28.3	Cost of materials ¹
March -----	do	27.8	Materials, parts, containers, etc., consumed ²
May -----	do	28.2	Resales
August -----	do	28.7	Fuels
November -----	do	27.7	Purchased electricity
Hours -----	millions	56.3	Contract work
			Quantity of electric energy used for heat and power:
			Purchased
			mil kWh
			Generated less sold
			1 141.5 (s)

See footnotes at end of table.

Table 3a. Summary Statistics for the Industry: 1987—Con.

[For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Item	Paints and allied products (SIC 2851)	Item	Paints and allied products (SIC 2851)
Total value of shipments	12 701.2	Inventories by stage of fabrication—Con.	
Primary products	11 728.3	Beginning of 1987—Con.	
Secondary products	240.1	Work in process	do..
Miscellaneous receipts, total	732.8	Materiel and supplies	do..
Value of resales	711.9	End of 1987	do..
Contract receipts	14.3	Finished goods	do..
Other miscellaneous receipts	6.6	Work in process	do..
Inventories by stage of fabrication:		Materiel and supplies	do..
Beginning of 1987	1 496.1	Primary product specialization ratio	percent..
Finished goods	823.5	Coverage ratio	do..

Note: For qualifications of data, see footnotes on table 1a.

¹Data on purchased services for the repair of buildings and machinery and for communication services are not included in cost of materials, etc., but are shown in table 3c.

²Data on materials consumed by type are shown in table 7. Data on amount purchased or transferred from foreign sources are shown in table 3c.

Table 3b. Gross Book Value of Depreciable Assets, Capital Expenditures, Retirements, Depreciation, and Rental Payments: 1987

[Million dollars. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Item	Paints and allied products (SIC 2851)	Item	Paints and allied products (SIC 2851)
Gross book value of depreciable assets:		Gross book value of depreciable assets—Con.	
Total:		Machinery and equipment—Con.	
Beginning of year	2 685.9	Beginning of year—Con.	
New capital expenditures ¹	275.0	New capital expenditures ¹	189.5
Used capital expenditures	25.3	Used capital expenditures	16.3
Retirements	65.0	Retirements	50.0
End of year	2 921.2	End of year	1 934.7
Buildings and other structures:		Depreciation charges during 1987	
Beginning of year	907.0	Total	185.2
New capital expenditures	85.5	Buildings and other structures	41.0
Used capital expenditures	9.0	Machinery and equipment	144.2
Retirements	15.0	Rental payments:	
End of year	986.4	Total	68.0
Machinery and equipment:		Buildings and other structures	35.7
Beginning of year	1 778.9	Machinery and equipment	32.3

Note: Retirements and depreciation data for establishments not included in the ASM sample were extrapolated from the historical ratio of retirements or depreciation to assets. These ratios were developed at the industry level.

¹Data on new machinery and equipment expenditures by type are provided in table 3c.

Table 3c. Supplemental Industry Statistics Based on Sample Estimates: 1987

[For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Item	Paints and allied products (SIC 2851)		Item	Paints and allied products (SIC 2851)	
	Amount (million dollars)	Relative standard error of estimate ¹ (percent)		Amount (million dollars)	Relative standard error of estimate ¹ (percent)
Purchased services:			New machinery and equipment expenditures—Con.		
Cost of purchased services for the repair of—			Automobiles, trucks, etc.	14.0	23
Buildings and other structures	15.6	(X)	Computers and peripheral	17.9	8
Response coverage ratio (percent) ²	58.1	(X)	All other	157.7	3
Machinery	32.7	(X)	Adjustment ratio ³	1.4	(X)
Response coverage ratio (percent) ²	63.7	(X)	Cost of materials, components, parts, etc., used	5 916.7	(X)
Cost of purchased communication services	20.3	(X)	Materials purchased or transferred from foreign sources ⁴	106.4	13
Response coverage ratio (percent) ²	62.1	(X)	Materials purchased or transferred from domestic sources	5 810.3	1
New machinery and equipment expenditures	189.5	(X)	Adjustment ratio ³	1.8	(X)

¹For description of relative standard error of estimate, see Qualifications of the Data in appendixes.

²Measure of extent to which respondents reported each item. Derived for each item by calculating the ratio of weighted employment for those sample establishments that reported the specific inquiry to weighted total employment for all sample establishments classified in industry. (See appendixes for explanation of sample weight.)

³Detail has been adjusted upwards to account for nonresponse. Inverse of the ratio shown represents a measure of the response to the inquiry. (See appendixes for further explanation.)

⁴Data may understate the true cost of imported parts, components, and supplies since some respondents do not know the origin of these materials. Includes cases where materials were purchased from secondary suppliers or where they were transferred from company-operated warehouses or other distribution points. Direct purchases from foreign suppliers and importers by domestic manufacturing establishments are believed to be reported accurately.

Table 4. Industry Statistics by Employment Size of Establishment: 1987

[For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Industry and employment size class	E1	All establish- ments (no.)	All employees		Production workers			Value added by manufac- ture (million dollars)	Cost of materials (million dollars)	Value of shipments (million dollars)	New capital expendi- tures (million dollars)	End-of-year inventories (million dollars)
			Number (1,000)	Payroll (million dollars)	Number (1,000)	Hours (millions)	Wages (million dollars)					
INDUSTRY 2851, PAINTS AND ALLIED PRODUCTS												
Total	E1	1 426	55.2	1 491.3	28.3	56.3	628.0	6 220.5	6 508.9	12 701.2	275.0	1 548.7
Establishments with an average of—												
1 to 4 employees	E9	273	.6	12.0	.4	.7	5.3	48.3	52.5	101.2	1.5	12.5
5 to 9 employees	E7	235	1.6	34.8	.9	1.7	14.7	146.3	159.8	305.6	5.7	37.0
10 to 19 employees	E3	292	4.1	98.9	2.1	4.3	39.8	339.0	382.7	719.4	11.0	87.8
20 to 49 employees	E1	317	10.1	246.8	5.3	10.4	102.3	868.1	1 046.8	1 910.3	29.6	240.4
50 to 99 employees	-	180	12.4	333.5	6.3	12.6	138.4	1 388.1	1 490.9	2 865.9	53.4	358.5
100 to 249 employees	-	103	15.9	434.4	8.4	16.8	193.4	1 975.9	2 062.3	4 033.2	79.1	486.8
250 to 499 employees	-	23	10.5	331.0	5.0	9.9	134.1	1 454.8	1 313.9	2 765.6	94.7	325.8
500 to 999 employees	-	1	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
1,000 to 2,499 employees	-	2	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Covered by administrative records ²	E9	512	3.0	55.2	1.6	3.1	23.9	219.6	235.1	454.7	6.9	52.3

Note: For qualifications of data, see footnotes on table 1a. Data shown as a (D) are included in underscored figures above.

¹Payroll and sales data for some small single unit companies with up to 20 employees (cutoff varied by industry) were obtained from administrative records of other Government agencies rather than from census report forms. These data were then used in conjunction with industry averages to estimate the items shown for these small establishments. This technique was also used for a small number of other establishments whose reports were not received at the time data were tabulated. The following symbols are shown for those employment-size classes where estimated data based on administrative-record data account for 10 percent or more of figures shown: E1—10 to 19 percent; E2—20 to 29 percent; E3—30 to 39 percent; E4—40 to 49 percent; E5—50 to 59 percent; E6—60 to 69 percent; E7—70 to 79 percent; E8—80 to 89 percent; E9—90 percent or more.

²Report forms were not mailed to small single unit companies with up to 20 employees (cutoff varied by industry). Payroll and sales data for 1987 were obtained from administrative records supplied by other agencies of the Federal Government. Those data were then used in conjunction with industry averages to estimate the items shown. Data are also included in respective employment-size classes shown.

Table 5a. Industry Statistics by Industry and Primary Product Class Specialization: 1987

[Table presents selected statistics for establishments according to their degree of specialization in products primary to their industry. Measures of plant specialization shown are (1) industry specialization: ratio of primary product shipments to total product shipments (primary plus secondary, excluding miscellaneous receipts) for the establishment; and (2) product class specialization: ratio of largest primary product class shipments to total product shipments (primary plus secondary, excluding miscellaneous receipts) for the establishment. See appendix for method of computing ratios. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Industry or product class code	Industry or primary product class	All establish- ments (number)	All employees		Production workers			Value added by manufac- ture (million dollars)	Cost of materials (million dollars)	Value of shipments (million dollars)	New capital expendi- tures (million dollars)
			Number (1,000)	Payroll (million dollars)	Number (1,000)	Hours (millions)	Wages (million dollars)				
2851	Paints and allied products: All establishments in industry	1 426	55.2	1 491.3	28.3	56.3	628.0	6 220.5	6 508.9	12 701.2	275.0
28511	Establishments with this product class primary: Architectural coatings	282	18.3	485.7	9.4	18.6	213.0	2 461.1	2 619.7	5 069.2	90.1
28512	Product finishes for original equipment manufacturers	253	18.1	541.0	8.8	17.5	213.1	1 769.6	1 867.1	3 635.4	122.5
28513	Special purpose coatings	131	8.5	228.1	4.4	9.0	96.8	1 120.3	1 011.7	2 116.4	24.1
28515	Miscellaneous allied paint products	92	4.1	103.2	2.4	4.8	47.2	353.7	466.2	820.4	23.0

Note: For qualifications of data, see footnotes on table 1a.

Table 5b. Industry-Product Analysis—Value of Shipments and Primary Product Shipments and Specialization and Coverage Ratios for the Industry: 1987 and Earlier Census Years

[An establishment is assigned to an industry based on shipment values of products representing largest amount considered primary to an industry. Frequently, establishment shipments comprise mixtures of products assigned to an industry (primary), those considered primary to other industries (secondary), and receipts for activities such as merchandising or contract work. Columns A-D show this product pattern for an industry, and column E shows primary product specialization ratio. The extent to which an industry's primary products are shipped by establishments classified in and out of an industry is shown in columns F-H and coverage ratio is shown in column I. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

Industry and product group code	Industry and census year	Value of shipments					Value of primary product shipments				
		Total (million dollars)	Primary products (million dollars)	Secondary products (million dollars)	Miscel- laneous receipts (million dollars)	Primary product special- ization ratio col. B ÷ col. B + C (percent)	Total made in all indus- ties (million dollars)	Made in this industry (million dollars)	Made in other indus- ties (million dollars)	Coverage ratio col. F ÷ col. G (percent)	
2851	Paints and allied products	1987--	12 701.2	11 728.3	240.1	732.8	98	12 078.8	11 728.3	350.5	97
		1982--	9 162.1	8 203.3	288.4	670.4	97	8 506.5	8 203.3	303.2	96
		1977--	6 629.7	5 911.8	256.1	461.8	96	6 123.0	5 911.8	211.2	97

Table 6a-1. Product and Product Classes—Value of Shipments by All Producers: 1987 and 1982

[Includes value of products of this industry produced by (1) establishments classified in this industry (primary) and (2) establishments classified in other industries (secondary). Transfers of products of this industry from one establishment of the same company (interplant transfers) are also included. For further explanation, see Value of Shipments in appendixes. For comparability of product classes and product codes between 1982 and 1987, see appendixes. For meaning of abbreviations and symbols, see introductory text.]

1987 product code	Product	1987		1982	
		Number of companies with shipments of \$100,000 or more	Value of product shipments ¹ (million dollars)	Number of companies with shipments of \$100,000 or more	Value of product shipments ¹ (million dollars)
2851- --	PAINTS AND ALLIED PRODUCTS				
	Total	(NA)	12 078.8	(NA)	8 506.5
28511 —	Architectural coatings:				
28511 00	Architectural coatings (for additional detail, see Current Industrial Report MA-28F, Paint, Varnish, and Lacquer) -----	285	4 173.7	(NA)	3 076.3
28512 —	Product finishes for original equipment manufacturers (OEM), excluding marine coatings:				
28512 00	Product finishes for original equipment manufacturers (OEM), excluding marine coatings (for additional detail, see Current Industrial Report MA-28F, Paint, Varnish, and Lacquer) -----	267	3 774.6	(NA)	2 491.8
28513 —	Special purpose coatings, including all marine coatings:				
28513 00	Special purpose coatings including all marine coatings (e.g., industrial construction and maintenance, traffic marking, transportation after market, marine, aerosol, etc.) (for additional detail, see Current Industrial Report MA-28F, Paint, Varnish, and Lacquer) -----	245	2 147.6	(NA)	1 380.7
28515 —	Miscellaneous allied paint products:				
28515 00	Miscellaneous allied paint products (including paint and varnish removers, thinners, pigment dispersions, glazing compounds, etc.) (for additional detail, see Current Industrial Report MA-28F, Paint, Varnish, and Lacquer) -----	232	994.4	(NA)	801.6
28510 —	Paints and allied products, n.s.k.				
28510 00	Paints and allied products, n.s.k., typically for establishments with 10 employees or more (see note) -----	(NA)	988.5	(NA)	756.2
28510 02	Paints and allied products, n.s.k., typically for establishments with less than 10 employees (see note) -----	(NA)	558.6	(NA)	503.6
		(NA)	429.8	(NA)	252.6

Note: In 1987 Census of Manufactures, data for establishments of small single unit companies with up to 20 employees were estimated from administrative-record data rather than data actually collected from respondents. Employment cutoffs used for administrative records for each industry and shipments figures are included in code ending with "002". In both 1987 and 1982 Censuses of Manufactures, products not completely identified on standard forms were coded in appropriate product class (five-digit) followed by "00" or to appropriate product group code (four-digit) followed by "000".

¹Data reported by all producers, not just those with shipments of \$100,000 or more.

Table 6a-2. Related Products From Current Industrial Reports Series—Value of Shipments by All Producers: 1987 and 1982

[Additional detail is provided in the Current Industrial Report series. For meaning of abbreviations and symbols, see introductory text]

1987 product code	Product	1987 product shipments		1982 product shipments	
		Quantity	Value (million dollars)	Quantity	Value (million dollars)
28511 —	MA28F, PAINT AND ALLIED PRODUCTS				
28511 —	Architectural coatings ----- mil gal..	527.0	4 245.4	392.3	3 079.9
28511 12	Exterior, solvent-type: Solvent thinned paints and tinting bases, including barn and roof paints ----- mil gal..	20.2	216.5		
28511 15	Solvent thinned enamels and tinting bases, including interior-exterior floor enamels ----- do..	14.5	152.7		
28511 25	Solvent thinned undercoaters and primers ----- do..	8.2	78.3		
28511 35	Solvent thinned clear finishes ----- do..	10.3	83.6	65.2	619.5
28511 37	Solvent thinned stains, including shingle and shake ----- do..	17.8	165.4		
28511 39	Other exterior solvent thinned coatings, including bituminous paints ----- do..	11.6	120.3		
28511 41	Exterior, water-type: Water thinned paints and tinting bases, including barn and roof paints ----- mil gal..	95.9	732.0		
28511 44	Water thinned undercoaters and primers ----- do..	7.7	58.7		
28511 49	Water thinned stains ----- do..	9.2	61.9	104.4	786.0
28511 55	Other exterior water thinned coatings ----- do..	11.4	100.1		
28511 63	Interior, solvent-type: Flat solvent thinned wall paints and tinting bases, including mill white paints ----- mil gal..	8.3	81.5		
28511 65	Gloss and quick drying enamels and other gloss solvent thinned paints and enamels ----- do..	4.4	53.6		
28511 69	Semigloss, eggshell, satin solvent thinned paints, and tinting bases ----- do..	15.0	155.7	48.8	471.2
28511 71	Solvent thinned undercoaters and primers ----- do..	7.0	64.3		
28511 75	Solvent thinned clear finishes ----- do..	8.6	100.7		
28511 77	Solvent thinned stains ----- do..	7.6	83.7		
28511 79	Other interior solvent thinned coatings ----- do..	5.8	63.6		
28511 81	Interior, water-type: Flat water thinned paints and tinting bases ----- mil gal..	125.5	834.3		
28511 83	Semigloss, eggshell, satin, and other gloss water thinned paints and tinting bases ----- do..	81.3	614.1		
28511 86	Water thinned undercoaters and primers ----- do..	10.2	64.9	161.9	1 115.3
28511 88	Other interior water thinned coatings ----- do..	15.9	106.8		
28511 93	Architectural lacquers ----- do..	10.5	81.7	5.6	45.2
28511 00	Architectural coatings, n.s.k. ----- do..	19.9	170.9	6.3	42.8

Table 6a-2. Related Products From Current Industrial Reports Series—Value of Shipments by All Producers: 1987 and 1982—Con.

[Additional detail is provided in the Current Industrial Report series. For meaning of abbreviations and symbols, see introductory text]

1987 product code	Product	1987 product shipments		1982 product shipments	
		Quantity	Value (million dollars)	Quantity	Value (million dollars)
MA28F, PAINT AND ALLIED PRODUCTS—Con.					
28512 —	Product finishes for original equipment manufacturers (OEM), excluding marine coatings	mil gal	327.1	3 637.0	261.1
28512 22	Automobile finishes	do	55.4	987.7	2 325.5
28512 23	Truck, bus, and recreational vehicle finishes	do	14.9	280.3	512.7
28512 25	Other transportation equipment finishes, including aircraft and railroad	do	3.2	54.3	
28512 35	Appliance, heating equipment, and air-conditioner finishes	do	5.8	70.1	18.7
28512 37	Wood furniture, cabinet, and fixture finishes	do	43.1	276.6	(NA)
28512 39	Wood and composition board flat stock finishes	do	7.3	53.2	(NA)
28512 41	Sheet, strip, and coil coatings, including siding	do	20.3	303.4	200.1
28512 43	Container and closure finishes	do	60.2	413.1	341.5
28512 47	Machinery and equipment finishes, including road building equipment and farm implement	do	16.2	181.3	16.6
28512 49	Nonwood furniture and fixture finishes, including business equipment finishes	do	14.3	187.7	(NA)
28512 52	Paper, paperboard, film, and foil finishes, excluding pigment binders	do	11.0	66.7	(NA)
28512 53	Electrical insulating coatings	do	3.6	34.1	(NA)
28512 55	Powder coatings	do	219.1	193.2	125.1
28512 67	Other industrial product finishes, excluding semimanufactured products, such as pigment dispersions and ink vehicles	do	27.6	333.0	(NA)
28512 00	Product finishes for original equipment manufacturers (OEM), excluding marine coatings, n.s.k.	do	24.9	202.4	3.3
28513 —	Special purpose coatings, including all marine coatings	do	137.3	2 018.6	146.6
Industrial new construction and maintenance paints (especially formulated coating for special conditions of industrial plants and/or facilities requiring protection against extreme temperatures, fungi, chemicals, fumes, etc.):					
28513 01	Interior	mil gal	13.0	169.8	11.1
28513 05	Exterior	do	28.5	323.6	21.6
28513 11	Traffic marking paints (all types, shelf goods, and highway department)	do	19.8	98.7	124.5
28513 13	Automotive, other transportation, and machinery refinish paints and enamels, including primers	do	44.3	903.8	34.1
28513 15	Marine paints, ship and offshore facilities and shelf goods for both new construction and marine refinish and maintenance, excluding spar varnish	do	9.1	144.1	(S)
28513 31	Aerosol-paint concentrates produced for packaging in aerosol containers	do	12.8	239.8	443.2
28513 00	Special purpose coatings, n.s.k.	do	9.9	138.9	2.8
28515 —	Miscellaneous allied paint products	do	147.4	858.2	(X)
28515 23	Paint and varnish removers	do	7.1	65.4	(S)
28515 31	Thinner for dopes, lacquers, and oleoresin thinner (including mixtures and proprietary thinners, sold as such)	do	47.7	209.6	153.7
28515 33	Pigment dispersions	do	9.8	112.6	(S)
28515 98	Other miscellaneous allied paint products, including brush cleaners, nonpressure wood preservatives, putty and glazing compounds, etc.	do	51.5	280.5	457.5
28515 00	Miscellaneous allied paint products, n.s.k.	do	31.3	190.2	(X)
					158.5

¹Data collected in 1982 Census of Manufactures.

²In 1987 and 1982, quantity was collected in pounds and converted to gallons using a conversion factor of 3 lb: 1 gal.

Table 6b. Product Classes—Value of Shipments by All Producers for Specified States: 1987 and 1982

[Million dollars. Product classes covered are those that are economically significant and whose production is geographically dispersed, provided dispersion is not approximated by data in table 2. Also, product classes are not shown if they are miscellaneous or "not specified by type" classes. Statistics for some States are withheld because they are either less than \$2 million in product class shipments or they disclose data for individual companies in 1987. For meaning of abbreviations and symbols, see introductory text. For comparability of product classes and product codes between 1982 and 1987 and explanation of terms, see appendixes]

Product class and geographic area	1987 value of product shipments	1982 value of product shipments	Product class and geographic area	1987 value of product shipments	1982 value of product shipments
28511, ARCHITECTURAL COATINGS			28511, ARCHITECTURAL COATINGS—Con.		
United States	4 173.7	3 076.3	New York	169.2	75.2
Alabama	35.1	18.3	North Carolina	55.5	56.2
California	652.2	460.3	Ohio	256.0	219.0
Colorado	52.3	22.8	Oklahoma	6.8	16.6
Florida	173.6	119.6	Oregon	17.2	10.1
Georgia	258.5	169.4			
Illinois	526.1	418.7	Pennsylvania	180.7	109.2
Indiana	47.6	32.8	Tennessee	27.8	18.6
Kentucky	176.1	176.3	Texas	406.4	327.7
Maryland	262.9	140.1	Virginia	44.8	41.8
Massachusetts	140.7	69.0	Washington	53.1	48.9
Michigan	26.6	29.3	Wisconsin	72.6	63.4
Missouri	97.3	60.3			
New Jersey	190.6	181.2			

Table 6b. Product Classes—Value of Shipments by All Producers for Specified States: 1987 and 1982—Con.

[Million dollars. Product classes covered are those that are economically significant and whose production is geographically dispersed, provided dispersion is not approximated by data in table 2. Also, product classes are not shown if they are miscellaneous or "not specified by type" classes. Statistics for some States are withheld because they are either less than \$2 million in product class shipments or they disclose data for individual companies in 1987. For meaning of abbreviations and symbols, see introductory text. For comparability of product classes and product codes between 1982 and 1987 and explanation of terms, see appendixes]

Product class and geographic area	1987 value of product shipments	1982 value of product shipments	Product class and geographic area	1987 value of product shipments	1982 value of product shipments
28512, PRODUCT FINISHES FOR ORIGINAL EQUIPMENT MANUFACTURERS			28513, SPECIAL PURPOSE COATINGS—Con.		
United States	3 774.6	2 491.8	Illinois	133.3	156.0
Alabama	64.7	32.6	Indiana	32.4	10.5
California	274.0	268.0	Maryland	102.7	71.9
Connecticut	17.0	12.7	Massachusetts	20.0	8.3
Florida	10.2	9.0	Michigan	87.2	(NA)
Georgia	106.5	75.2	Missouri	205.9	138.5
Illinois	423.2	269.5	New Jersey	186.9	142.5
Indiana	157.3	96.4	New York	33.1	24.4
Iowa	23.3	25.7	Ohio	343.8	168.3
Kentucky	55.1	30.8	Pennsylvania	98.1	54.3
Massachusetts	33.4	35.5	Texas	134.3	103.9
Michigan	644.6	319.7	Washington	4.4	7.2
Minnesota	16.6	31.7	Wisconsin	25.2	11.9
Missouri	63.1	35.6			
New Jersey	136.3	154.8			
New York	67.9	71.7	28515, MISCELLANEOUS ALLIED PAINT PRODUCTS		
North Carolina	186.9	160.1	United States	994.4	801.6
Ohio	795.8	380.5	California	102.8	94.6
Oklahoma	6.8	(NA)	Connecticut	28.1	9.6
Pennsylvania	251.0	189.0	Florida	4.4	2.5
South Carolina	22.8	8.1	Georgia	44.9	21.5
Tennessee	18.7	20.0	Illinois	144.8	72.0
Texas	109.2	79.0	Indiana	34.1	8.8
Virginia	53.2	16.8	Kentucky	46.7	(NA)
Wisconsin	151.0	68.3	Massachusetts	23.1	18.4
			Michigan	22.0	30.9
			Missouri	14.4	23.9
28513, SPECIAL PURPOSE COATINGS			New Jersey	170.8	170.9
United States	2 147.6	1 380.7	New York	18.0	26.1
Alabama	5.7	4.6	Ohio	50.9	54.6
California	183.1	111.1	Oregon	6.7	5.5
Colorado	7.2	(NA)	Pennsylvania	24.6	19.3
Florida	29.6	14.4	South Carolina	7.5	(NA)
Georgia	52.3	54.5	Texas	31.9	28.8
			Virginia	8.6	3.2

Table 6c. Historical Statistics for Product Classes—Value Shipped by All Producers: 1987 and Earlier Years

[Million dollars. For meaning of abbreviations and symbols, see introductory text. For comparability of product classes and product codes between 1982 and 1987 and explanation of terms, see appendixes]

1987 product code	Product class	1987	1986 ¹	1985 ¹	1984 ¹	1983 ¹	1982	1977	1972
2851-	Paints and allied products	12 078.8	11 230.3	10 931.6	10 043.9	9 528.4	8 506.5	6 123.0	3 520.2
28511	Architectural coatings	4 173.7	4 090.0	3 829.6	3 597.6	3 307.0	3 076.3	2 234.0	1 306.6
28512	Product finishes for original equipment manufacturers	3 774.6	3 487.3	3 463.5	3 262.2	2 822.3	2 491.8	1 957.2	1 052.7
28513	Special purpose coatings	2 147.6	1 903.3	1 918.1	1 660.5	1 729.1	1 380.7	727.8	340.2
28515	Miscellaneous allied paint products	994.4	1 010.4	1 044.5	894.1	822.9	801.6	672.9	488.6
28510	Paints and allied products, n.s.k.	988.5	739.3	675.9	629.4	847.0	756.2	531.1	332.1

¹Figures are estimates derived from a representative sample of manufacturing establishments. Standard errors associated with estimates are published in annual survey of manufactures publications for this period.

Table 7. Materials Consumed by Kind: 1987 and 1982

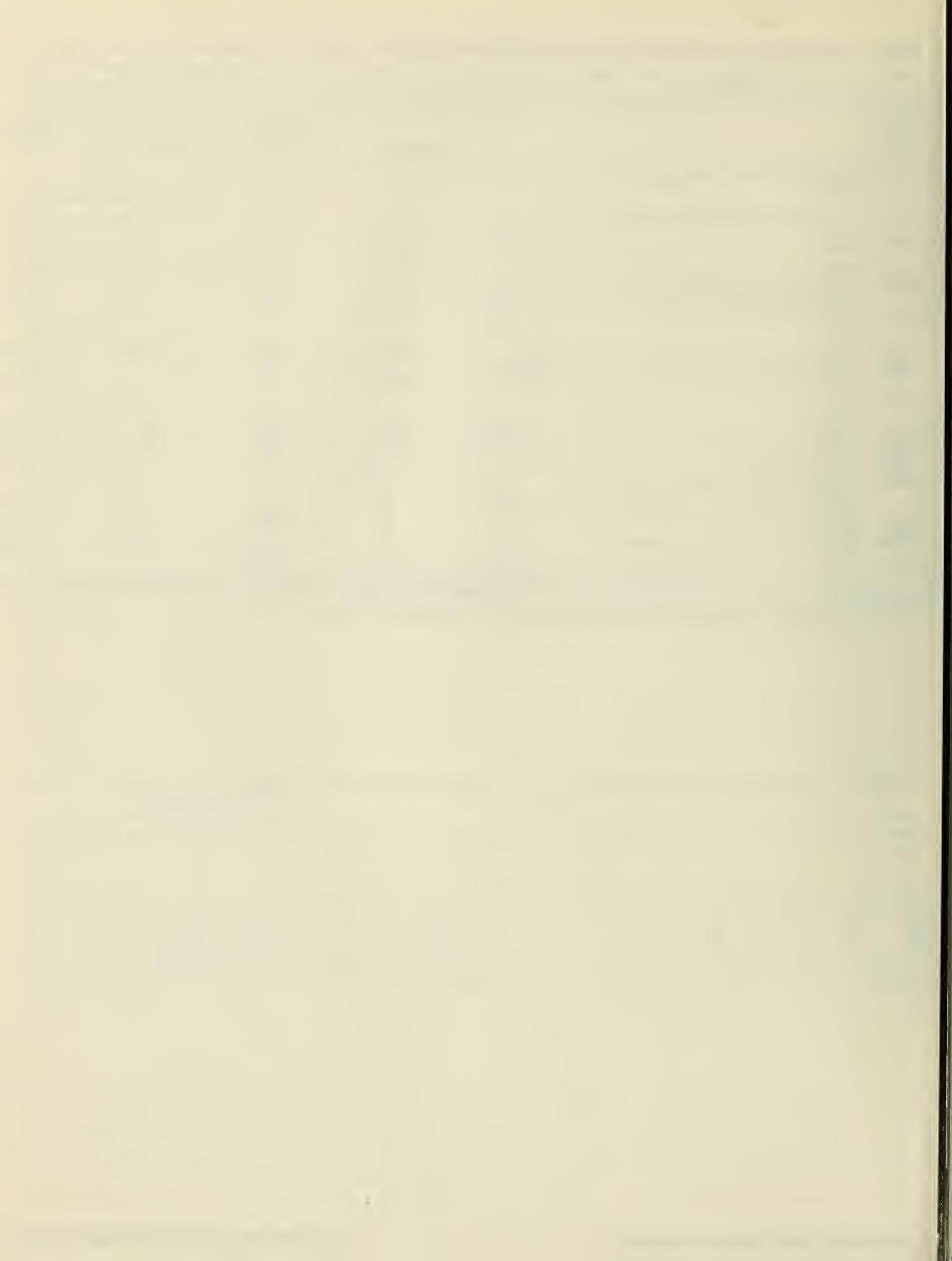
[Includes quantity and cost of materials consumed or put into production by establishments classified only in this industry. For further explanation, see Cost of Materials in appendixes. For meaning of abbreviations and symbols, see introductory text.]

1987 material code	Material	1987		1982	
		Quantity ¹	Delivered cost (million dollars)	Quantity ¹	Delivered cost (million dollars)
INDUSTRY 2851, PAINTS AND ALLIED PRODUCTS					
	Materials, parts, containers, and supplies -----	(X)	5 916.7	(X)	4 621.6
207619	Vegetable oils ----- mil lb-----	*183.0	65.0	**181.6	74.4
281611	Pigments: Titanium dioxide, composite and pure (100% TiO ₂) ----- mil lb-----	763.7	544.5	575.9	365.3
281602	Other inorganic pigments, including chrome colors, whiting, white and red lead, litharge, lithopone, zinc oxide, calcium carbonate precipitated, etc.-----	(X)	189.3	(X)	147.9
286532	Organic color pigments, lakes, and toners -----	(X)	200.4	(X)	108.7
Solvents:					
286554	Hydrocarbons (toluene, xylene, etc.) ----- mil lb-----	**818.2	144.7	808.0	162.3
286907	Alcohols (butyl, ethyl, isopropyl, etc.)----- do-----	*283.6	83.6	248.9	81.2
286971	Ketones and esters (methyl ethyl ketone, ethyl acetate, etc.)----- do-----	435.2	153.3	(S)	140.0
286002	Other ----- do-----	*382.5	131.5	(S)	122.2
Plastics resins:					
282111	Alkyds ----- mil lb-----	*626.3	285.6	*490.1	243.3
282112	Acrylics ----- do-----	627.9	343.0	*389.7	188.0
282113	Vinyl ----- do-----	**595.0	168.0	*270.9	115.2
282114	Other plastics resins ----- do-----	*764.5	516.7	*294.2	262.3
291105	Petroleum thinners (naphtha) ----- mil gal-----	(S)	74.9	(S)	104.8
329511	Nonmetallic minerals and earths, ground or otherwise treated (calcium carbonate, talc, silica, kaolin, mica, barite, soapstone, clay, and other clay minerals) for use as extenders -----	(X)	152.6	(X)	81.1
280008	All other organic and inorganic chemicals, n.e.c. -----	(X)	552.9	(X)	(*)
340001	Metal containers -----	(X)	379.6	(X)	328.0
970099	All other materials and components, parts, containers, and supplies -----	(X)	655.9	(X)	31 099.3
971000	Materials, parts, containers, and supplies, n.s.k. ² -----	(X)	1 275.2	(X)	99.76

¹For some establishments, data have been estimated from central unit values which are based on quantity-cost relationships of reported data. The following symbols are used when percentage of each quantity figure estimated in this manner equals or exceeds 10 percent of published figure: * 10 to 19 percent estimated; ** 20 to 29 percent estimated. If 30 percent or more is estimated, figure is replaced by (S).

²Total cost of materials of establishments that did not report detailed materials data, including establishments that were not mailed a form.

³For 1982, material code 280008 was included with material code 970099.



APPENDIX A.

Explanation of Terms

This appendix is in two sections. Section 1 includes items requested of all establishments mailed census of manufactures forms including annual survey of manufactures (ASM) forms. Note that this section also includes several items (number of establishments and companies, value added, classes of products, and specialization and coverage ratios) not included on the report forms but derived from information collected on the forms. Section 2 covers supplementary items requested only from establishments included in the ASM sample. Results of the supplementary ASM inquiries are included in table 3c of this report.

SECTION 1. ITEMS COLLECTED OR DERIVED BASED ON ALL CENSUS OF MANUFACTURES (INCLUDING ASM) REPORT FORMS

Number of establishments and companies—As discussed in the Introduction, a separate report was required for each manufacturing establishment (plant) with one employee or more. An establishment is defined as a single physical location where manufacturing is performed. A company, on the other hand, is defined as a business organization consisting of one establishment or more under common ownership or control.

If the company operated at different physical locations, even if the individual locations were producing the same line of goods, a separate report was requested for each location. If the company operated in two or more distinct lines of manufacturing at the same location, a separate report was requested for each activity.

An establishment not in operation for any portion of the year was requested to return the report form with the proper notation in the "Operational Status" section of the form. In addition, the establishment was requested to report data on any employees, capital expenditures, inventories, or shipments from inventories during the year.

In this report, data are shown for establishments in operation at any time during the year. A comparison with the number of establishments in operation at the end of the year will be provided in the Introduction of the General Summary subject report.

Employment and related items—The report forms requested separate information on production workers for a specific payroll period within each quarter of the year and on other employees as of the payroll period which included the 12th of March.

All employees—This item includes all full-time and part-time employees on the payrolls of operating manufacturing establishments during any part of the pay period which included the 12th of the months specified on the report form. Included are all persons on paid sick leave, paid holidays, and paid vacations during these pay periods.

Officers of corporations are included as employees; proprietors and partners of unincorporated firms are excluded. The "all employees" number is the average number of production workers plus the number of other employees in mid-March. The number of production workers is the average for the payroll periods including the 12th of March, May, August, and November.

Production workers—This item includes workers (up through the line-supervisor level) engaged in fabricating, processing, assembling, inspecting, receiving, storing, handling, packing, warehousing, shipping (but not delivering), maintenance, repair, janitorial and guard services, product development, auxiliary production for plant's own use (e.g., power plant), recordkeeping, and other services closely associated with these production operations at the establishment covered by the report. Employees above the working-supervisor level are excluded from this item.

All other employees—This item covers nonproduction employees of the manufacturing establishment including those engaged in factory supervision above the line-supervisor level. It includes sales (including driver salespersons), sales delivery (highway truck drivers and their helpers), advertising, credit, collection, installation and servicing of own products, clerical and routine office function, executive, purchasing, financing, legal, personnel (including cafeteria, medical, etc.), professional, and technical employees. Also included are employees on the payroll of the manufacturing establishment engaged in the construction of major additions or alterations to the plant and utilized as a separate work force.

In addition to reports sent to operating manufacturing establishments, information on employment during the payroll period which included March 12 and annual payrolls also was requested of auxiliary units (e.g., administrative offices, warehouses, and research and development laboratories) of multiestablishment companies. However, these figures are not included in the totals for individual

industries shown in this report. They are included in the general summary and geographic area reports as a separate category.

Payroll—This item includes the gross earnings of all employees on the payroll of operating manufacturing establishments paid in the calendar year 1987. Respondents were told they could follow the definition of payrolls used for calculating the Federal withholding tax. It includes all forms of compensation, such as salaries, wages, commissions, dismissal pay, bonuses, vacation and sick leave pay, and compensation in kind, prior to such deductions as employees' Social Security contributions, withholding taxes, group insurance, union dues, and savings bonds. The total includes salaries of officers of corporations; it excludes payments to proprietors or partners of unincorporated concerns. Also excluded are payments to members of Armed Forces and pensioners carried on the active payroll of manufacturing establishments.

The census definition of payrolls is identical to that recommended to all Federal statistical agencies by the Office of Management and Budget. It should be noted that this definition does not include employers' Social Security contributions or other nonpayroll labor costs, such as employees' pension plans, group insurance premiums, and workers' compensation.

The ASM provides estimates of employers' supplemental labor costs, both those required by Federal and State laws and those incurred voluntarily or as part of collective bargaining agreements. (Supplemental labor costs are explained later in this appendix.)

As in the case of employment figures, the payrolls of separate auxiliary units of multiestablishment companies are not included in the totals for individual industries or industry groups.

Production-worker hours—This item covers hours worked or paid for at the plant, including actual overtime hours (not straight-time equivalent hours). It excludes hours paid for vacations, holidays, or sick leave.

Cost of materials—This term refers to direct charges actually paid or payable for items consumed or put into production during the year, including freight charges and other direct charges incurred by the establishment in acquiring these materials. It includes the cost of materials or fuel consumed, whether purchased by the individual establishment from other companies, transferred to it from other establishments of the same company, or withdrawn from inventory during the year.

The important components of this cost item are (1) all raw materials, semifinished goods, parts, containers, scrap, and supplies put into production or used as operating supplies and for repair and maintenance during the year, (2) electric energy purchased, (3) fuels consumed for heat, power, or the generation of electricity, (4) work done by

others on materials or parts furnished by manufacturing establishments (contract work), and (5) products bought and resold in the same condition. (See discussion of duplication of data below.)

Specific materials consumed—In addition to the total cost of materials, which every establishment was required to report, information also was collected for most manufacturing industries on the consumption of major materials used in manufacturing. The inquiries were restricted to those materials which were important parts of the cost of production in a particular industry and for which cost information was available from manufacturers' records. Information on the establishments consuming less than a specified amount (usually \$10,000) of a specific material were not requested to report consumption of that material separately. Also, the cost of materials for the small establishments for which either administrative records or short forms were used was imputed as "not specified by kind." (See the introduction for the importance of administrative records in the industry.)

Value of shipments—This item covers the received or receivable net selling values, f.o.b. plant (exclusive of freight and taxes), of all products shipped, both primary and secondary, as well as all miscellaneous receipts, such as receipts for contract work performed for others, installation and repair, sales of scrap, and sales of products bought and resold without further processing. Included are all items made by or for the establishments from materials owned by it, whether sold, transferred to other plants of the same company, or shipped on consignment. The net selling value of products made in one plant on a contract basis from materials owned by another was reported by the plant providing the materials.

In the case of multiunit companies, the manufacturer was requested to report the value of products transferred to other establishments of the same company at full economic or commercial value, including not only the direct cost of production but also a reasonable proportion of "all other costs" (including company overhead) and profit. (See discussion of duplication of data below.)

Individual products—As in previous censuses, data were collected for most industries on the quantity and value of individual products shipped. In the 1987 census program, information was collected on the output of approximately 11,000 individual product items. The term "product", as used in the census of manufactures, represents the finest level of detail for which output information was requested. Consequently, it is not necessarily synonymous with the term "product" as used in the marketing sense. In some cases, it may be much more detailed and, in other cases, it is more aggregative. For example, "pharmaceutical preparations" was distributed into over 100 terms; whereas, "motor gasoline" was reported as a single item.

Approximately 6,600 of the product items were listed separately on the 1987 census report forms. Data for

about 4,400 products were obtained in the monthly, quarterly, or annual surveys comprising the Current Industrial Reports series of the Census Bureau. Totals for the year 1987 for these items, as derived from the commodity surveys, are shown in the "products shipped" table (table 6a-2).

The list of products for which separate information was collected was prepared after consultation with industry and government representatives. Comparability with previous figures was given considerable weight in the selection of product categories so that comparable 1982 information is presented for most products.

Typically, both quantity and value of shipments information were collected. However, if quantity was not significant or could not be reported by manufacturers, only value of shipments was collected.

Shipments include both commercial shipments and transfers of products to other plants of the same company. For industries in which a considerable portion of the total shipments is transferred to other plants of the same company, separate information on interplant transfers also was collected. Moreover, for products that are used to a large degree within the same establishment as materials or components in the fabrication of other products, total production and often consumption of the item within the plant was collected. Typically, the information on production also was collected for products for which there are significant differences between total production and shipments in a given year because of wide fluctuations in finished goods inventories. Other measures of output of products with long production cycles were used as appropriate and feasible.

Classes of products—To summarize the product information, the separate products were aggregated into classes of products that, in turn, were grouped into all primary products of each industry. The code structure used is a seven-digit number for the individual product, a five-digit number for the class of product, and a four-digit number for the total primary products in an industry. (See Introduction, Industry Classification of Establishments, for application of the coding structure to the assignment of SIC codes for establishments.)

In the 1987 census, the 11,000 products were grouped into approximately 1,500 separate classes on the basis of general similarity of manufacturing processes, types of materials used, and the like. However, the grouping of products was affected by the economic significance of the class and, in some cases, dissimilar products were grouped because the products were not sufficiently significant to warrant separate classes.

Duplication in cost of materials and value of shipments—The aggregate of the cost of materials and value of shipments figures for industry groups and for all manufacturing industries includes large amounts of duplication since the products of some industries are used as materials by others. This duplication results, in part, from the

addition of related industries representing successive stages in the production of a finished manufactured product. Examples are the addition of flour mills to bakeries in the food group and the addition of pulp mills to paper mills in the paper and allied products group of industries. Estimates of the overall extent of this duplication indicate that the value of manufactured products exclusive of such duplication (the value of finished manufactures) tends to approximate two-thirds of the total value of products reported in the annual survey.

Duplication of products within individual industries is significant within a number of industry groups, e.g., machinery and transportation industries. These industries frequently include complete machinery and their parts. In this case, the parts made for original equipment are materials consumed for assembly plants in the same industry.

Even when no significant amount of duplication is involved, value of shipments figures are deficient as measures of the relative economic importance of individual manufacturing industries or geographic areas because of the wide variation in ratio of materials, labor, and other processing costs of value of shipments, both among industries and within the same industry.

Before 1962, cost of materials and value of shipments were not published for some industries which included considerable duplication. Since then, these data have been published for all industries at the United States level and beginning in 1964, for all geographic levels.

Value added by manufacture—This measure of manufacturing activity is derived by subtracting the cost of materials, supplies, containers, fuel, purchased electricity, and contract work from the value of shipments (products manufactured plus receipts for services rendered). The result of this calculation is adjusted by the addition of value added by merchandising operations (i.e., the difference between the sales value and the cost of merchandise sold without further manufacture, processing, or assembly) plus the net change in finished goods and work-in-process between the beginning- and end-of-year inventories.

For those industries where value of production is collected instead of value of shipments (see footnote in table 1a), value added is adjusted only for the change in work-in-process inventories between the beginning and end of year. For those industries where value of work done is collected, the value added does not include an adjustment for the change in finished goods or work-in-process inventories.

"Value added" avoids the duplication in the figure for value of shipments that results from the use of products of some establishments as materials by others. Value added is considered to be the best value measure available for comparing the relative economic importance of manufacturing among industries and geographic areas.

New and used capital expenditures—For establishments in operation and any known plants under construction, manufacturers were asked to report their new expenditures for (1) permanent additions and major alterations to

manufacturing establishments, and (2) machinery and equipment used for replacement and additions to plant capacity if they were of the type for which depreciation accounts were ordinarily maintained.

The totals for new expenditures include expenditures leased from nonmanufacturing concerns through capital leases, new facilities owned by the Federal Government but operated under contract by private companies, and plant and equipment furnished to the manufacturer by communities and nonprofit organizations. Also excluded are expenditures for used plant and equipment (although reported in the census), expenditures for land, and cost of maintenance and repairs charged as current operating expenses.

Manufacturers also were requested to report the value of all used buildings and equipment purchased during the year at the purchase price. For any equipment or structure transferred for the use of the reporting establishment by the parent company or one of its subsidiaries, the value at which it was transferred to the establishment was to be reported. Furthermore, if the establishment changed ownership during the year, the cost of the fixed assets (building and equipment) was to be reported under used capital expenditures.

Total expenditures for used plant and equipment is a universe figure; it is collected on all census forms. However, the breakdown of this figure between expenditures for used buildings and other structures and expenditures for used machinery and equipment is collected only on the ASM form. The data for total new capital expenditures, new building expenditures, and new machinery expenditures, as well as the data for total used expenditures, are shown in table 3b.

End-of-year inventories—Respondents were asked to report their 1986 and 1987 end-of-year inventories at cost or market. Effective with the 1982 Economic Censuses, this change to a uniform instruction for reporting inventories was introduced for all sector reports. Prior to 1982, respondents were permitted to value inventories using any generally accepted accounting method (FIFO, LIFO, market, to name a few). In 1982, LIFO users were asked to first report inventory values prior to the LIFO adjustment and then to report the LIFO reserve and the LIFO value after adjustment for the reserve.

SECTION 2. ITEMS COLLECTED ONLY ON ASM REPORT FORMS

The following items were collected only from establishments included in the ASM sample:

1. **Supplemental labor costs**—Supplemental labor costs are divided into legally required expenditures and payments for voluntary programs. The legally required portion consists primarily of Federal old age and survivors' insurance, unemployment compensation, and workers' compensation. Payments for voluntary programs include all programs not

Because of this change in reporting instructions, the 1982 through 1987 data for inventories and value added by manufacture included in the tables of this report are not comparable to the prior-year data shown in table 1a of this report and in historical census of manufactures and annual survey of manufactures publications.

In using inventory data by stage of fabrication for "all industries" and at the two-digit industry level, it should be noted that an item treated as a finished product by an establishment in one industry may be reported as a raw material by another establishment in a different industry. For example, the finished-product inventories of a steel mill would be reported as raw materials by a stamping plant. Such differences are present in the inventory figures by stage of fabrication shown for individual industries, industry groups, and "all manufacturing", which are aggregates of figures reported by establishments in specified industries.

Specialization and coverage ratios—These items are not collected on the report forms but are derived from the data shown in table 5b. An establishment is classified in a particular industry if its shipments of primary products of that industry exceed in value its shipments of the products of any other single industry.

As noted in the introduction, an establishment's shipments include those products assigned to an industry (primary products), those considered primary to other industries (secondary products), and receipts for miscellaneous activities (merchandising, contract work, resales, etc.). Specialization and coverage ratios have been developed to measure the relationship of primary product shipments to the data on shipments for the industry shown in tables 1a through 5a and data on product shipments shown in tables 6a through 6c.

Specialization ratio represents the ratio of primary product shipments to total product shipments (primary and secondary, excluding miscellaneous receipts) for the establishments classified in the industry.

Coverage ratio represents the ratio of primary products shipped by the establishments classified in the industry to the total shipments of such products that are shipped by all manufacturing establishments wherever classified.

specifically required by legislation whether they were employer initiated or the result of collective bargaining. They include the employer portion of such plans as insurance premiums, premiums for supplemental accident and sickness insurance, pension plans, supplemental unemployment compensation, welfare plans, stock purchase plans on which the employer payment is not subject to withholding tax, and deferred profit-sharing plans.

They exclude such items as company-operated cafeterias, in-plant medical services, free parking lots, discounts on employee purchases, and uniforms and work clothing for employees. While the excluded items do benefit employees and all or part of their cost generally is similar to the items covered in the ASM labor costs statistics, accounting records generally do not provide reliable figures on net employee benefits of these types.

2. **Retirements of depreciable assets**—Included in this item is the gross value of assets sold, retired, scrapped, destroyed, etc., during 1987. When a complete operation or establishment changed ownership, the respondent was instructed to report the value of the assets sold at the original cost as recorded in the books of the seller. The respondent also was requested to report retirements of equipment or structures owned by a parent company that the establishment was using as if it were a tenant.
3. **Depreciation charges for fixed assets**—This item includes depreciation and amortization charged during the year against assets. Depreciation charged against fixed assets acquired since the beginning of the year and against assets sold or retired during the year are components of this category. Respondents were requested to make certain that they did not report accumulated depreciation.
4. **Rental payments**—Total rental payments is collected on all census forms. However, the breakdown between rental payments for buildings and other structures and rental payments for machinery and equipment is collected only on the ASM forms. This item includes rental payments for the use of all items for which depreciation reserves would be maintained if they were owned by the establishment, e.g., structures and buildings, and production, office, and transportation equipment. Excluded are royalties and other payments for the use of intangibles and depletable assets, and land rents where separable.
5. **Depreciable assets**—Total value of gross depreciable assets is collected on all census forms.

When an establishment of a multiestablishment company was charged rent by another part of the same company for the use of assets owned by the company, it was instructed to exclude that cost from rental payments. However, the book value (original cost) of these company-owned assets was to be reported as assets of the establishment at the end of the year.

If there were assets at an establishment rented from another company and the rents were paid centrally by the head office of the establishment, the company was instructed to report these rental payments as if they were paid directly by the establishment.

However, the detail for depreciable assets is collected only on the ASM forms. The data encompass all fixed depreciable assets on the books of establishments at the beginning and end of the year. The values shown (book value) represent the actual cost of assets at the time they were acquired, including all costs incurred in making the assets usable (such as transportation and installation). Included are all buildings, structures, machinery, and equipment (production, office, and transportation equipment) for which depreciation reserves are maintained. Excluded are nondepreciable capital assets, including inventories and intangible assets, such as timber and mineral rights.

The definition of fixed depreciable assets is consistent with the definition of capital expenditures. For example, expenditures include actual capital outlays during the year, rather than the final value of equipment put in place and buildings completed during the year. Accordingly, the value of assets at the end of the year includes the value of construction in progress. In addition, respondents were requested to make certain that assets at the beginning of the year plus new and used capital expenditures, less retirements, equalled assets at the end of the year.

6. **New and used capital expenditures**—The data for total new capital expenditures, new building expenditures, new machinery expenditures, and total used capital expenditures are collected on all census forms. However, the breakdown between expenditures for used buildings and other structures and expenditures for used machinery and equipment is collected only on the ASM form. (See further explanation on capital expenditures in section 1.)
7. **Quantity of electric energy consumed for heat and power**—Data on the cost of purchased electric energy were collected on all census forms. However, data on the quantity of purchased electric energy were collected only on the ASM forms. In addition, information was collected on the quantity of electric energy generated by the establishment and the quantity of electric energy sold or transferred to other plants of the same company.
8. **Breakdown of new capital expenditures for machinery and equipment**—ASM establishments were requested to separate their capital expenditures for new machinery and equipment into (1) automobiles, trucks, etc., for highway use, (2) computers and peripheral data processing equipment, and (3) all other.

The category "automobiles, trucks, etc., for highway use" is intended to measure expenditures for vehicles designed for highway use that were acquired through a purchase or lease-purchase agreement.

Vehicles normally operating off public highways (vehicles specifically designed to transport materials, property, or equipment on mining, construction, logging, and petroleum development projects) are excluded from this item.

9. **Foreign content of cost of materials**—Establishments included in the ASM sample panel were requested to provide information on foreign-made materials purchased or transferred from foreign sources. This includes materials acquired from a central warehouse or other domestic establishment of the same company but made in an operation outside of the 50 States, District of Columbia, Puerto Rico, or U.S. territories.
10. **Cost of purchased services**—ASM establishments were requested to provide information on the cost of purchased services for the repair of buildings and other structures, the repair of machinery, and communication services. Included in the cost of purchased services for the repair of buildings and machinery are payments made for all maintenance and repair work on buildings and equipment, such as painting, roof repairs, replacing parts, and overhauling equipment. Such payments made to other establishments of the same company and for repair and maintenance of any leased property also are included. Extensive repairs or reconstruction that were capitalized are considered capital expenditures for used buildings and machinery and are, therefore, excluded from this item. Repair and maintenance costs provided by an owner as part of a rental contract or incurred directly by an establishment in using its own work force also are excluded.

Three basic approaches were utilized to produce these statistics.

1. For items 1 through 6, data were estimated (imputed) for all non-ASM establishments using the available data in the establishment record and industry-based parameters. The statistics were then generated by simply tabulating all census records including the imputed value for non-ASM establishments and the unweighted value for ASM establishments. Separate imputation rates were developed and are shown in the table. For quantity of purchased electricity for heat and power (item 7), a similar procedure was used; however, the imputation parameters were geographically-based instead of industry-based. For quantities of generated less sold electricity, no imputation was performed for non-ASM establishments. The estimates for these items are simply tabulations of unweighted ASM values.

Since the published statistics for these items were developed from the complete census universe and not just the ASM establishments, there are no sampling variances associated with these statistics. However, there is an unknown level of bias for each of the items due to the imputation of the non-ASM establishments. This bias is felt to be small due to the strong correlation between the items being imputed and the collected items that were used to generate the impute values.

2. For items 8 and 9, the estimates were developed using a ratio estimation methodology. For item 8, an estimate of the breakout of new capital expenditures for machinery and equipment into the three categories was made from ASM establishments reporting these categories. The estimated proportions were then applied to the corresponding Census value for new capital expenditures for machinery and equipment to produce the estimates.

The estimates for item 9, foreign content of cost of materials, were developed in a similar manner based on costs of parts, supplies, and components (item 5a) as the control total for the three categories.

For items 8 and 9, an adjustment ratio of the following form was computed.

$$R_j = \frac{NM_c}{TME_{asm}}$$

where:

NM_c = the census value of new capital expenditures for machinery and equipment

TME_{asm} = the weighted ASM value of new capital expenditures for machinery and equipment from reporters of the detailed breakout data

3. For item 10, cost of purchased services, the estimates were made by simply tabulating weighted data for all the ASM records that reported the item. A response coverage ratio (a measure of the extent to which respondents reported for each item) is shown in table 3c for the three types of services. It is derived for each item by calculating the ratio of the weighted employment (establishment data multiplied by sample weight, see appendix B) for those ASM establishments that reported the specific inquiry to the weighted total employment for all ASM establishments classified in the industry.

APPENDIX B.

Annual Survey of Manufactures (ASM) Sampling and Estimating Methodologies

DESCRIPTION OF SURVEY SAMPLE

The Annual Survey of Manufactures (ASM) contains two components. The mail portion of the survey is a probability sample of about 56,000 manufacturing establishments selected from a total of about 220,000 establishments. These 220,000 establishments represent all manufacturing establishments of multiunit companies and all single establishment companies mailed schedules in the 1982 Census of Manufactures. This mail portion is supplemented annually by a Social Security Administration list of new manufacturing establishments opened after 1982 and a list of new multiunit manufacturing establishments identified from the Census Bureau's Company Organization Survey.

The 1984 through 1988 ASM sample differs slightly from the previous sample. For the current panel, all establishments of companies with 1982 shipments in manufacturing in excess of \$500 million were included in the survey panel with certainty. There are approximately 500 such companies collectively accounting for approximately 18,000 establishments. For the remaining portion of the mail survey, the establishment was defined as the sampling unit. For this portion, all establishments with 250 employees or more and establishments with a very large value of shipments also were included in the survey panel with certainty. A total of 12,100 establishments were selected from this portion of the universe with certainty. Therefore, of the 56,000 manufacturing establishments included in the ASM panel, approximately 31,000 are selected with certainty. These certainty establishments collectively account for approximately 80 percent of the total value of shipments in the 1982 census.

Smaller establishments in the remaining portion of the mail survey were sampled with probabilities ranging from 0.999 to 0.005 in accordance with mathematical theory for optimum allocation of a sample. The probabilities of selection assigned to the smaller establishments were proportional to measures of size determined for each establishment. The measures of size depend directly upon each establishment's 1982 product class values and the historic variability of the year-to-year shipments of each product class. Product classes displaying more volatile year-to-year change in shipments at the establishment level were sampled at a heavier rate.

This method of assigning measures of size was used in order to maximize the precision (that is, minimize the variance of estimates of the year-to-year change) in the value of product class shipments. Implicitly, it also gave weight differences in employment, value added, and other

general statistics, since these are highly correlated with value of shipments. Individual sample selection probabilities were obtained by multiplying each establishment's final measure of size by an overall sampling fraction coefficient calculated to yield a total expected sample size.

The sample selection procedure gave each establishment in the sampling frame an independent chance of selection. This method of independent selection permits the rotation of small establishments out of a given sample panel without introducing a bias into the survey estimates.

The nonmail portion of the survey includes all single-establishment companies that were tabulated as administrative records in the 1982 Census of Manufactures. Although this portion contained approximately 130,000 establishments, it accounted for less than 2 percent of the estimate for total value of shipments at the total manufacturing level. This portion was not sampled; rather, the data for every establishment in this group were estimated based on selected information obtained annually from the administrative records of the Internal Revenue Service and the Social Security Administration. This administrative-record information, which includes payroll, total employment, industry classification, and physical location of the establishment, was obtained under conditions which safeguard the confidentiality of both tax and census records. Estimates of data other than payroll and employment for these small establishments were developed from industry averages.

The corresponding estimates for the mail and nonmail establishments were added together, along with the base-year differences, as defined in the Description of Estimating Procedure section, to produce the figures shown in this publication.

DESCRIPTION OF ESTIMATING PROCEDURES

Most of the ASM estimates for the years 1983-1986 were computed using a difference estimation procedure. For each item, a base-year difference was developed. This base-year difference is equal to the difference between the 1982 census published number for an item total and the linear ASM estimate of the total for 1982. The ASM linear estimate was obtained by multiplying each sample establishment's data by its sample weight (the reciprocal of its probability of selection) and summing the weighted values.

These base-year differences were then added to the corresponding current-year linear estimates, which include the sum of the estimates for the mail and nonmail establishments, to produce the estimates for the years 1983-1986. Estimates developed by this procedure usually are far more reliable than comparable linear estimates developed from the current sample data alone.

The 1987 sample estimates for the purchased service items, shown in table 3c, are strictly ASM linear estimates, however, developed only from ASM establishments that reported the specific item.

The remaining estimates in table 3c, showing the breakdown of expenditures for new machinery and equipment and costs of parts (separated into purchases from foreign sources and purchases from domestic sources), were computed as ratio estimates. To do this, linear estimates of the new machinery detail items were developed from the ASM establishments and were ratio adjusted to the corresponding census total for new machinery. In a similar fashion, the ASM linear estimates of the detailed purchased materials items were ratio adjusted to the corresponding census total for cost of parts.

QUALIFICATIONS OF THE DATA

The estimates developed from the sample are apt to differ somewhat from the results of a survey covering all companies in the sampled lists but otherwise conducted under essentially the same conditions as the actual sample survey. The estimates of the magnitude of the sampling errors (the differences between the estimates obtained and the results theoretically obtained from a comparable, complete-coverage survey) are provided by the standard errors of the estimates.

The particular sample selected for the ASM is one of a large number of similar probability samples that, by chance, might have been selected under the same specifications. Each of the possible samples would yield somewhat different sets of results, and the standard errors are measures of the variation of all the possible sample estimates around the theoretical, comparable, complete-coverage values.

Estimates of the standard errors have been computed from the sample data for selected statistics in this report. They are presented in the form of relative standard errors (the standard errors divided by the estimated values to which they refer).

In conjunction with its associated estimate, the relative standard error may be used to define confidence intervals (ranges that would include the comparable, complete-coverage value for specified percentages of all the possible samples).

The complete coverage value would be included in the range:

1. From one standard error below to one standard error above the derived estimate for about two-thirds of all possible samples.
2. From two standard errors below to two standard errors above the derived estimate for about 19 of 20 of all possible samples.
3. From three standard errors below to three standard errors above the derived estimate for nearly all samples.

An inference that the comparable, complete-survey result would be within the indicated ranges would be correct in approximately the relative frequencies shown. Those proportions, therefore, may be interpreted as defining the confidence that the estimates from a particular sample would differ from complete-coverage results by as much as one, two, or three standard errors, respectively.

For example, suppose an estimated total is shown as 50,000 with an associated relative standard error of 2 percent, that is, a standard error of 1,000 (2 percent of 50,000). There is approximately 67 percent confidence that the interval 49,000 to 51,000 includes the complete-coverage total, about 95 percent confidence that the interval 48,000 to 52,000 includes the complete-coverage total and almost certain confidence that the interval 47,000 to 53,000 includes the complete coverage total.

In addition to the sample errors, the estimates are subject to various response and operational errors: errors of collection, reporting, coding, transcription, imputation for nonresponse, etc. These operational errors also would occur if a complete canvass were to be conducted under the same conditions as the survey. Explicit measures of their effects generally are not available. However, it is believed that most of the important operational errors were detected and corrected in the course of the Bureau's review of the data for reasonableness and consistency. The small operational errors usually remain. To some extent, they are compensating in the aggregated totals shown. When important operational errors were detected too late to correct the estimates, the data were suppressed or were specifically qualified in the tables.

As derived, the estimated standard errors included part of the effect of the operational errors. The total errors, which depend upon the joint effect of the sampling and operational errors, are usually of the order of size indicated by the standard error, or only moderately higher. However, for particular estimates, the total error may considerably exceed the standard errors shown.

The concept of complete coverage under the conditions prevailing for the ASM is not identical to the complete coverage of the census of manufactures, as the censuses have been conducted. Nearly all types of operational errors that affect the ASM also occur in the censuses. The ASM and the censuses, are conducted under quite different conditions, and operational errors can be better controlled in the ASM than in the censuses. As a result, for many of the census figures, the errors are of the same order of size as the total errors of the corresponding annual survey estimates. The differences between the census and ASM operating conditions also disturb, to some degree, the comparability of the ASM and census data.

Any figures shown in the tables in this publication having an associated standard error exceeding 15 percent may be of limited reliability. However, the figure may be combined with higher-level totals, creating a broader aggregate, which then may be of acceptable reliability.

APPENDIX C.

Changes in Census of Manufactures

Product Classes for 1987

[Based on revisions to the Standard Industrial Classification (SIC) Manual definitions of some product classes were revised for 1987. Listed below are the revisions to the product classes]

1987	1982	1987	1982	1987	1982	1987	1982
2011B	2011A 2013A pt	20866—Con.	20861 pt—Con. 20995 pt	2221F—Con.	22211 pt—Con. 22212 pt 22213 pt 22214 pt 22215 pt 22216 pt 22217 pt	23259—Con.	23279—Con. 23289 pt
20135	20130	20910	20324 pt 20910			23260	23280
2013B	2013A pt					23261	23281
20150	20160 20170	20925 20926	20924	2221G	22211 pt 22212 pt 22213 pt 22214 pt 22215 pt 22216 pt 22217 pt	23262	23284
20151	20161 20171	20961 20962 20963	20992			23269	23289 pt
20152	20162 20172	20980	20981 pt			23293	23271 pt 23292
20153	20163 20173	20997	20341 pt 20440 pt 20982 2099A pt	2221H	22211 pt 22212 pt 22213 pt 22214 pt 22215 pt 22216 pt 22217 pt	23530	23510 pt 23520
20154	20164 20174	20999	2099B pt			23531	23521
20155	20165 20175	2099D	20995 pt	2221J	22218	23532	23522
20159	20179	2099E 2099F 2099G	2099C 20981 pt	2221K	22219	23533	23510 pt
20226	20220			2221M	2221A	23692	23631
20239	20239 2099A pt			2221B	22211 pt 22212 pt 22213 pt 22214 pt 22215 pt 22216 pt	23693	23691
20267	20266 pt 2099B pt				22218	23699	23619 23699
20268	20266 pt 2099B pt			2221C	22211 pt 22212 pt 22213 pt 22214 pt 22215 pt 22216 pt	23813	23811 pt 23812 pt
20324	20324 pt				2221D	22210	23814
20343	20341 pt				22211 pt 22212 pt 22213 pt 22214 pt 22215 pt 22216 pt	22510	23811 pt 23812 pt
20380	20380 pt					22510	23952
20384	20381 pt 20383 pt					22512 pt	23951 pt
20415	20383 pt 20415					22518	23958
20440	20440 pt			2221E	22211 pt 22212 pt 22213 pt 22214 pt 22215 pt 22216 pt	22517 pt	23959
20450	20383 pt 20450					22520	23964
20470	20470 pt			2221F	22211	22524	23964
20480	20470 pt 20480			2221G	22219	22526	23950
2048A	20475 20476			2221H	2221A	22525	24930
20530	20380 pt 20381 pt					22525	24920 pt
20640	20650 pt			2221B	22211 pt 22212 pt 22213 pt 22214 pt 22215 pt 22216 pt	22585	26610
20642	20652					22589	24931
20643	20653			2221C	22211 pt 22212 pt 22213 pt 22214 pt 22215 pt 22216 pt	22517 pt	24920 pt
20649	20659					22524	24932
20660	20660 20990 pt			2221D	22211 pt 22212 pt 22213 pt 22214 pt 22215 pt 22216 pt 22217 pt	22730	24920 pt
20669	20668 20998					22710 pt	24933
20680	20341 pt 20650 pt 20657					22720 pt	24934
20863	20861 pt			2221E	22211 pt 22212 pt 22213 pt 22214 pt 22215 pt 22216 pt 22217 pt	22790 pt	24996
20864							24935
20865							26611
20866	20861 pt 20862	2221F	22211 pt		22731	22710 pt	24998
						22720 pt	24936
							24998
							24937
							24995
							24994
							2499A pt
							25115
							25158
							25145
							25142
							25146
							25143
							25147
							25144
							25425
							25991
							25990
							25992
							25994
							2621B
							26612
							26560
							26540
							26561
							26541
							26562
							26542
							26563
							26545
							26570
							26544
							26510
							26544

[Based on revisions to the Standard Industrial Classification (SIC) Manual definitions of some product classes were revised for 1987. Listed below are the revisions to the product classes]

1987	1982	1987	1982	1987	1982	1987	1982
26710	26410 pt	26753	26455	27591	27511 pt	28350—Con.	2831A—Con.
26711	26415	26760	26470	27592	27512 pt	28351	28352
26712	26416	26761	26471	27593	27513 pt	28360	28310
26713	26419	26763	26473	27594	27514 pt	28361	28311
26714	2641A	26764	26474	27595	27515 pt	28362	28312
26720	26410 pt	26770	26420	27596	27516 pt	28363	28317
26721	26411	26780	26480	27597	27511 pt 27512 pt 27513 pt 27514 pt 27515 pt 27516 pt	28364	28318 28319
26722	26413	26781	26481			28656	2911C
26723	26414	26782	26482			28691	2911B
26724	2641B	26790	26460 pt 26490	27598	27519	28916	28915
26730	26430 pt	26791	26493	27599	27531	28917	
26731	26435	26792	26494	2759A	27510 pt	2911D	2911D pt
26732	26436	26793	26496	27960	27530 27950	29990	2911D pt 29990
26733	26437	26794	26460 pt	27961	27951 35557 pt	31430	31430 31433 31434 31435
26740	26430 pt	26795	26497	27962	27952		
26741	26434	27416 27417	27411	27963	27532 27547 27930 27940	31440	31440 31445 31446 31447 31448
26742	26438	27418	27412				
26750	26450	27419	27414	28247	28243 28245	31490	31490
26751	26453	2741A 2741B	27415	28248	28246		31491 31493 31495 31496 31497
26752	26454	27590	27510 pt	28350	2831A		

APPENDIX D.

Changes in Census of Manufactures

Product Codes for 1987

[Based on revisions to the Standard Industrial Classification (SIC) Manual, definitions of some product codes were revised for 1987. Listed below are the revisions to the product codes. The terms published and collected are defined as follows: (1) published refers to the code used in the published reports for 1987 and 1982, and (2) collected refers to the code appearing on the report forms for 1987.]

1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published
20119 14	20119 14	20119 12 20119 13	20159 17	20179 17	20179 17	20343 21	20341 21	20341 21	20488 21	20488 21	20488 18
2011B 15	2011B 15	2011A 15	20159 51	20179 51	20179 51	20343 23	20341 23	20341 23	20488 23	20488 23	20488 17 pt
2011B 41	2011B 41	2011A 41	20159 53	20179 53	20179 53	20343 29	20341 29	20341 29	20488 25	20488 25	20488 19 pt
2011B 55	2011B 55	2011A 55	20159 55	20179 55	20179 55	20343 31	20341 31	20341 32 20341 33 20341 35	20488 31	20488 31	20488 17 pt
2011B 99	2011B 99	2011A 31 2011A 51	20159 57	20179 57	20179 57	20352 31 20352 34	20352 31 20352 34	20352 33	20488 33	20488 33	20488 19 pt
20135 13	20135 13	20130 00	20226 00	20220 11	20220 00	20354 35	20354 35	20354 31 20354 33 20354 39	2048A 01	20475 35	20475 35
20135 17	20135 17		20235 22	20235 22	20235 28 pt	20382 26 20382 28	20382 26 20382 28	20382 27	2048A 03	20475 52	20475 52
20151 33	20161 33	20161 33	20235 29	20235 29	20235 21 20235 28 pt	20384 51	20383 51	20383 51	2048A 05	20476 61	20476 61
20151 34	20161 34	20161 34	20239 23	20239 23	20239 29 pt	20384 59	20383 59	20383 59	2048A 07	20476 63	20476 63
20151 36	20161 36	20161 36	20239 25	2099A 12	2099A 11 pt	20384 63	20383 63	20381 18	2048A 09	20476 65	20476 65
20151 39	20161 39	20161 39 20171 39	20239 28	20239 28	20239 29 pt	20384 69	20383 69	20383 61 pt	2048A 11	20476 67	20476 67
20151 41	20161 41	20161 41 20171 41	20239 32 20239 38	20239 32 20239 38	20239 31 20239 37 20239 39	20411 26	20411 26	20411 24 20411 25	2048A 13	20476 69	20476 69
20152 21	20162 21	20162 21 20172 21	20240 31	20240 31	20240 98 pt	20411 26	20411 26	20411 24 20411 25	20530 11	20381 11	20381 11
20152 23	20162 23	20162 23 20172 23	20240 52 20240 54	20240 52 20240 54	20240 51	20412 19	20412 19	20412 00 20412 17	20530 13	20381 13	20381 13
20153 22	20163 22	20163 21 pt 20173 22	20240 99	20240 99	20240 98 pt	20415 91 20415 93	20383 65 20383 66	20383 61	20530 14	20381 14	20381 14
20153 24	20163 24	20163 23 pt 20173 24	20267 11	2099B 11	2099B 11	20430 21 20430 23	20430 21 20430 23	20430 19	20530 17	20381 17	20381 17
20153 26	20163 26	20163 25 pt 20173 26	20267 13	2099B 13	2099B 13	20430 55	20430 55	20430 52 pt	20642 00	20652 00	20652 00
20153 27	20163 27	20163 21 pt 20163 23 pt 20163 25 pt 20173 27	20267 14 20267 16	2099B 14 2099B 16	2099B 19 pt	20430 57	20430 57	20430 53 pt	20643 00	20653 00	20653 00
20154 14	20164 14	20164 14 20174 14	20267 17	20267 17	20266 17	20430 61	20430 61	20430 59 pt	20649 21	20659 21	20659 21
20154 16	20164 16	20164 16 20174 16	20267 18	2099B 18	2099B 19 pt	20430 63	20430 63	20430 52 pt 20430 53 pt 20430 59 pt	20649 76	20659 76	20659 76
20155 11	20165 11	20165 11 20175 11	20268 13	2099B 51	2099B 51	20450 91 20450 93	20383 67 20383 68	20383 61	20669 11	20668 11	20668 11 20998 11
20155 13	20165 13	20165 13 20175 13	20268 15	20268 15	20266 15	20464 72 20464 75	20464 72 20464 70	20464 69	20669 21	20668 21	20668 21 20998 21
20155 15	20165 15	20165 15 20175 15	20268 19	20268 19	20266 19	20481 21	20481 21	20481 13 pt	20669 63	20668 63	20668 63 20998 63
20155 31	20165 31	20165 31 20175 31	20331 13	20331 13	20331 71	20481 22	20481 22	20481 17 pt	20669 71	20668 71	20668 71 20998 71
20155 32	20165 32	20165 32 20175 32	20331 32	20331 32	20331 72	20481 23	20481 23	20481 26 pt	20669 75	20668 75	20668 75 20998 75
20155 33	20165 33	20165 33 20175 33	20331 36	20331 36	20331 73	20481 24	20481 24	20481 28 pt	20669 81	20668 81	20668 81
20155 34	20165 34	20165 34 20175 34	20331 38	20331 38	20331 74	20481 31	20481 31	20481 13 pt	20669 92	20668 92	20668 92 20998 92
20155 39	20165 39	20165 39 20175 39	20331 41	20331 41	20331 75	20481 32	20481 32	20481 17 pt	20669 93	20668 93	20668 93 20998 93
20155 48	20165 48	20165 48 20175 48	20332 05	20332 05	20332 08 20332 09 20332 92	20481 33	20481 33	20481 26 pt	20669 95	20668 95	20668 95 20998 95
20159 11	20179 11	20179 11	20332 37	20332 37	20332 96	20481 34	20481 34	20481 28 pt	20670 11	20670 11	20670 12
20159 13	20179 13	20179 13	20336 14	20336 14	20336 13	20483 01 20483 02	20483 01 20483 02	20483 00	20670 14	20670 14	20670 12
20159 15	20179 15	20179 15	20336 15	20336 15	20336 19	20485 03 20485 04	20485 03 20485 04	20485 00	20680 13	20657 13	20657 13
20159 48	20165 48	20165 48 20175 48	20343 13	20341 13	20341 13	20487 05 20487 06	20487 05 20487 06	20487 00	20680 15	20657 15	20657 15
20159 11	20179 11	20179 11	20343 15	20341 15	20341 15	20488 11	20488 11	20488 14	20680 17	20657 17	20657 17
20159 13	20179 13	20179 13	20343 18	20341 18	20341 18	20488 12 20488 13	20488 12 20488 13	20488 15	20680 33	20657 33	20657 33
20159 15	20179 15	20179 15				20488 13			20680 35	20657 35	20657 35

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1987 published	1987 collected	1982 published									
20680 37	20657 37	20657 37	20863 20— Con.	20863 20— Con.	20863 01— Con.	20922 27	20922 27	20922 29	2099E 33	2099E 33	2099C 33
20680 53	20657 53	20657 53		20863 36	20922 31	20922 28	20922 28	20922 31	2099E 38	2099E 38	2099C 38
20680 55	20657 55	20657 55		20863 37		20923 11	20923 11	20923 21	2099E 39	2099E 39	2099C 39
20680 57	20657 57	20657 57		20863 38	20923 13	20923 11	20923 13	20923 17	2099F 44	2099F 44	2099C 44
20680 61	20657 61	20657 61		20863 39		20923 15	20923 15	20923 22	2099F 46	2099F 46	2099C 46
20680 62	20657 62	20657 62		20863 42		20923 17	20923 17				
20680 63	20657 63	20657 63		20863 44							
20680 64	20657 64	20657 64		20863 45							
20680 65	20657 65	20657 65		20863 47							
20740 98	20740 98	20740 00									
20750 98	20750 98	20750 00	20863 30	20863 30	20861 01 pt	20923 19	20923 19	20923 23	2099G 11	2099G 11	2099C 11
20760 94	20760 94	20760 00		20861 03 pt		20923 31	20923 31	20923 26	2099G 25	2099G 25	2099C 25
20760 95	20760 95			20861 07 pt	20923 33	20923 33			2099G 51	2099G 51	2099C 51
20760 96	20760 96			20861 10 pt		20923 35	20923 35	20923 28	2099G 85	2099G 85	2099C 85
20760 97	20760 97			20861 11 pt		20925 21	20925 21	20924 21	2099G 91	2099G 91	2099C 91
20760 98	20760 98			20861 12 pt		20925 22	20925 22	20924 22	2099G 98	2099G 98	2099C 98
20821 01	20821 01	20821 14		20861 13 pt		20925 23	20925 23	20924 33 pt	2211B 00	2211B 00	22111 00 pt
20821 02	20821 02	20821 15		20861 14 pt		20925 24	20925 24	20924 24		22112 00 pt	22112 00 pt
20821 03	20821 03	20821 18		20861 15 pt		20925 25	20925 25	20924 25		22113 00 pt	22113 00 pt
20821 04	20821 04	20821 19 pt		20861 16 pt		20925 26	20925 26	20924 26		22114 10 pt	22114 10 pt
20824 99	20824 99	20824 71		20861 17 pt		20925 31	20925 31	20924 31		22114 50 pt	22114 50 pt
20824 99	20824 99	20824 81		20861 18 pt		20925 32	20925 32	20924 32		22115 00 pt	22115 00 pt
20824 99	20824 99	20824 91		20861 19 pt		20925 33	20925 33	20924 33 pt		22116 00 pt	22116 00 pt
20840 45	20840 45	20840 43		20861 20 pt		20925 34	20925 34	20924 34			
20840 46	20840 46	20840 43		20861 21 pt		20925 35	20925 35	20924 35	2211D 00	2211D 00	22111 00 pt
20851 48	20851 48	20851 41		20861 22 pt		20925 36	20925 36	20924 36		22112 00 pt	22112 00 pt
20851 48	20851 48	20851 45		20861 23 pt		20926 11	20926 11	20924 98		22113 00 pt	22113 00 pt
20851 48	20851 48	20851 49		20861 24 pt		20926 13	20926 13			22114 10 pt	22114 10 pt
20863 10	20863 10	20861 01 pt		20861 25 pt		20926 98	20926 98			22114 50 pt	22114 50 pt
20863 10	20863 10	20861 03 pt		20861 26 pt		20951 15	20951 15	20915 18		22115 00 pt	22115 00 pt
20863 10	20863 10	20861 07 pt		20861 27 pt		20951 17	20951 17	20951 17		22116 00 pt	22116 00 pt
20863 10	20863 10	20861 10 pt		20861 28 pt		20961 00	20992 13	20992 12			
20863 10	20863 10	20861 11 pt		20861 29 pt		20980 21	20981 21	20981 21			
20863 10	20863 10	20861 12 pt		20861 30 pt		20980 31	20981 31	20981 31			
20863 10	20863 10	20861 13 pt		20861 31 pt		20997 13	2099A 13	2099A 11 pt	2211F 00	2211F 00	22117 00
20863 10	20863 10	20861 14 pt		20861 32 pt		20997 21	2099A 21	2099A 21		22117 11	22117 11
20863 10	20863 10	20861 15 pt		20861 33 pt		20997 31	2099A 31	2099A 31		22117 31	22117 31
20863 10	20863 10	20861 16 pt		20861 34 pt		20997 41	2099A 41	2099A 41		22117 51	22117 51
20863 10	20863 10	20861 17 pt		20861 35 pt		20997 61	20341 36	20341 36		22117 61	22117 61
20863 10	20863 10	20861 18 pt		20861 36 pt		20997 71	20440 19	20440 19	2211H 42	2211H 42	22114 00
20863 10	20863 10	20861 19 pt		20861 37 pt		20997 81	20982 35	20982 35		22114 10 pt	22114 10 pt
20863 10	20863 10	20861 20 pt		20861 38 pt		20997 85	20982 41	20982 41		22114 30 pt	22114 30 pt
20863 10	20863 10	20861 21 pt		20861 39 pt		20997 98	2099A 98	2099A 98		22114 50 pt	22114 50 pt
20863 10	20863 10	20861 22 pt		20861 40 pt		20999 21	2099B 21	2099B 21		22115 00 pt	22115 00 pt
20863 10	20863 10	20861 23 pt		20861 41 pt		20999 31	2099B 31	2099B 31		22116 00 pt	22116 00 pt
20863 10	20863 10	20861 24 pt		20861 42 pt		20999 35	2099B 35	2099B 98 pt			
20863 10	20863 10	20861 25 pt		20861 43 pt		20999 41	2099B 41	2099B 41			
20863 10	20863 10	20861 26 pt		20861 44 pt		20999 53	2099B 53	2099B 98			
20863 10	20863 10	20861 27 pt		20861 45 pt		20999 55	2099B 55				
20863 10	20863 10	20861 28 pt		20861 46 pt		20999 98	2099B 99				
20863 20	20863 20	20863 01	20873 21	20863 03	20860 00	20999 21	2099B 21	2099B 21	2221B 00	2221B 00	22211 00 pt
20863 20	20863 20	20863 07		20863 10	20873 13 pt	20999 31	2099B 31	2099B 31		22212 00 pt	22212 00 pt
20863 20	20863 20	20863 12		20863 13	20873 39 pt	20999 35	2099B 35	2099B 98 pt		22213 00 pt	22213 00 pt
20863 20	20863 20	20863 14		20863 15	20873 39 pt	20999 41	2099B 41	2099B 41		22214 00 pt	22214 00 pt
20863 20	20863 20	20863 16		20863 17	20873 39 pt	20999 53	2099B 53	2099B 98		22215 00 pt	22215 00 pt
20863 20	20863 20	20863 18		20863 19	20873 39 pt	20999 55	2099B 55			22216 00 pt	22216 00 pt
20863 20	20863 20	20863 20		20863 21	20873 39 pt	20999 98	2099B 99			22217 10 pt	22217 10 pt
20863 20	20863 20	20863 22		20863 23	20873 43	20999 D 82	20995 82	20995 82		22217 30 pt	22217 30 pt
20863 20	20863 20	20863 24		20863 26	20873 45	20999 D 83	20995 83	20995 83			
20863 20	20863 20	20863 27		20863 28	20910 19	20999 D 86	20995 86	20995 86			
20863 20	20863 20	20863 29		20863 31	20910 19	2099E 31	2099E 31	2099C 31	2221C 00	2221C 00	22214 00 pt
20863 20	20863 20	20863 32		20863 34						22215 00 pt	22215 00 pt
20863 20	20863 20	20863 33								22216 00 pt	22216 00 pt

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1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published
2221C 00— Con.	2221C 00— Con.	22214 00 pt 22217 10 pt 22217 30 pt	22514 37	22512 37	22512 37	22840 51	22840 51	22840 15 pt 22840 28 pt	23531 01	23521 15	23521 15
			22514 39	22512 39	22512 36 22512 38	22840 61	22840 61	22840 35	23531 03	23521 41	23521 41
2221D 00	2221D 00	22211 00 pt 22212 00 pt 22213 00 pt 22214 00 pt 22215 00 pt 22216 00 pt 22217 10 pt 22217 30 pt	22514 45	22512 45	22512 45	22950 00	22950 00	22950 00	23531 05	23521 83	23521 83
			22518 14	22517 14	22517 15 pt	22991 00	22910 00 pt	22910 00 pt	23531 09	23521 91	23521 91
			22518 17	22517 17	22517 17	22991 12	22910 12	22910 11	23532 01	23522 12	23522 12
			22525 11	22523 11	22523 11	22991 13	22910 13	22910 13	23532 03	23522 15	23522 15
2221E 00	2221E 00	22211 00 pt 22212 00 pt 22213 00 pt 22214 00 pt 22215 00 pt 22216 00 pt 22217 10 pt 22217 30 pt	22525 15	22512 11	22512 11	22991 15	22910 15	22910 19	23532 05	23522 17	23522 17
			22525 17	22523 17	22523 17	22991 21	22910 21	22910 00	23532 09	23522 98	23522 98
			22525 21	22523 21	22523 21	22991 23	22910 23	22910 00	23533 01	23510 12	23510 12
			22525 27	22523 27	22523 27	22991 35	22910 35	22910 36 22910 38	23533 03	23510 41	23510 41
2221F 00	2221F 00	22211 00 pt 22212 00 pt 22213 00 pt 22214 00 pt 22215 00 pt 22216 00 pt 22217 10 pt 22217 30 pt	22525 31	22523 31	22523 31	22991 47	22910 47	22910 47	23533 09	23510 93	23510 93
			22525 51	22523 51	22523 51	22994 22	22940 22	22940 14 pt 22940 21 pt	23613 00	23613 00	23611 30 pt 23612 00
			22525 57	22523 57	22523 57	22994 31	22940 31	22940 14 pt 22940 21 pt	23614 00	23614 00	23611 30 pt
			22525 61	22523 61	22523 61				23615 00	23615 00	23611 10
2221H 10	2221H 10	22211 00 pt 22212 00 pt 22213 00 pt 22214 00 pt 22215 00 pt 22216 00 pt 22217 10 pt 22217 30 pt	22525 81	22523 81	22523 81	22994 35	22940 35	22940 14 pt 22940 21 pt	23692 00	23631 00	23631 00
			22526 25	22524 25	22524 25	22994 39	22940 39	22940 14 pt 22940 28	23693 40	23691 40	23691 40
			22526 42	22517 13 22524 41	22517 15 pt 22524 41	22994 41	22940 41	22940 41	23693 70	23693 70	23691 70
			22526 51	22524 51	22524 51	22995 17	22930 17	22930 17	23693 80	23691 80	23691 92
2221H 20	2221H 20	22211 00 pt 22212 00 pt 22213 00 pt 22214 00 pt 22215 00 pt 22216 00 pt 22217 10 pt 22217 30 pt	22585 00	22920 00	22920 00	22995 19	22930 19	22930 19	23813 00	23813 00	23811 00 pt 23812 00 pt
			22617 00	22617 00	22617 11 22617 31 22617 51 22617 61	22995 32	22930 32	22930 32	23814 00	23814 00	23811 00 pt 23812 00 pt
			22619 00	22619 00	22619 11 22619 31 22619 51 22619 71	22995 33	22930 33	22930 34	23910 10	23910 10	23910 11 pt 23910 17 pt 23910 18 pt 23910 51 pt 23910 57 pt 23910 58 pt
2221J 00	2221J 00	22218 00 22218 15 22218 25 22218 35 22218 38 22218 55 22218 58 22218 64 22218 67	22628 00	22628 00	22628 20 22628 30 22628 50 22628 61	22996 01	22996 01	22992 61	23910 12	23910 12	23910 11 pt
			22629 00	22629 00	22629 20 22629 30 22629 50 22629 61	22996 03	22996 03	22992 75	23910 19	23910 19	23910 17
			22731 00	22710 00	22710 00	23213 00	23213 00	23212 00 23214 00 pt	23910 25	23910 25	23910 18 pt
2221M 21	2221M 21	2221A 21 2221A 22	22732 20	22720 20	22720 20	23216 00	23216 00	23214 00 pt	23910 52	23910 52	23910 51 pt
2221M 23	2221M 23	2221M 23 2221M 24	22732 40	22720 40	22720 40	23222 00	23215 00	23215 00	23910 59	23910 59	23910 57
2221M 25	2221M 25	2221A 25 2221A 26	22733 00	22790 00	22790 00	23229 11	23229 93	93000 00	23910 62	23910 62	23910 58 pt
2221M 27	2221M 27	2221A 27 2221A 28	22815 10	22833 10	22831 00	23229 12	23219 15	23219 15	23921 11	23921 11	23921 12 pt 23921 13 pt 23921 15 pt 23921 17 pt 23921 18 pt 23921 19 pt 23921 27 pt 23921 28 pt 23921 29 pt
2221M 33	2221M 33	2221A 33 2221A 37	22815 20	22833 20	22833 20	23252 00	23283 00	23283 00			
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2221M 43	2221M 43	2221A 43 2221A 46	22823 13	22823 13	22823 27 pt 22823 32 pt 22823 35 pt	23262 00	23284 00	23284 00	23921 20	23921 20	23921 17 pt
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1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published	
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23924 14	23924 14	23924 11 pt 23924 13 pt 23924 39 pt		24113 11 24113 13	24113 11 24113 13	24113 00	24367 00	24367 00	24367 01 24367 03	24994 17	2499A 17	2499A 17
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23924 33	23924 33	23924 31 pt 23924 39 pt		24114 12 24114 14	24114 12 24114 14	24114 13	24411 63	24411 63 24411 83	24994 25	2499A 25	2499A 25	
23924 35	23924 35	23924 31 pt 23924 39	24114 16	24114 16	24114 17 pt	24522 17 24522 19	24522 17 24522 19	24522 21	24994 41	2499A 41	2499A 41	
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23924 46	23924 46	23924 44 pt 23924 45 pt		24212 33	24212 33	24212 22 pt	24919 03 24919 05 24919 07 24919 09	24919 03 24919 05 24919 07 24919 09	24994 85	2499A 85	2499A 85	
23924 48	23924 48	23924 47 pt 23924 49 pt	24212 35	24212 35	24212 23 pt	24931 03	24931 03	24921 03	24920 03	24994 89	2499A 89	2499A 89
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23924 54	23924 54	23924 49 pt		24215 18	24215 18	24215 78 pt	24931 09	24921 09	24920 09			
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23924 95	23924 95	23924 67 23924 88		24266 13	24266 13		24933 14	24993 14	24993 14	25115 91 25115 99	25115 91 25115 99	25115 98
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23952 00	23951 12	23951 12 23959 11	24318 73 24318 77	24318 73	24318 73	24318 75	24935 00	26611 00	26611 00	25117 43 25117 45 25117 47 25117 49	25117 43 25117 45 25117 47 25117 49	25117 48
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23964 37	23951 37	23951 37	24353 98	24353 98	24353 01 pt 24353 03 pt	24936 17	24998 17	24998 17	24998 17	25145 15	25145 15	25141 15
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23990 99	23990 99	23990 99	24363 11	24363 11	24363 01 pt 24363 03 pt	24937 31	24995 31	24995 31	24995 31	25145 19	25145 19	25141 98 pt
24111 09	24111 09	24111 25 pt		24363 11	24363 11	24363 01 pt 24363 03 pt	24937 31	24995 31	24995 31	25145 21	25145 21	25142 11
24111 27	24111 27	24111 19 24111 25 pt	24363 31	24363 31	24363 01 pt 24363 03 pt	24994 11	2499A 11	2499A 11	2499A 11	25145 27	25145 27	25142 51
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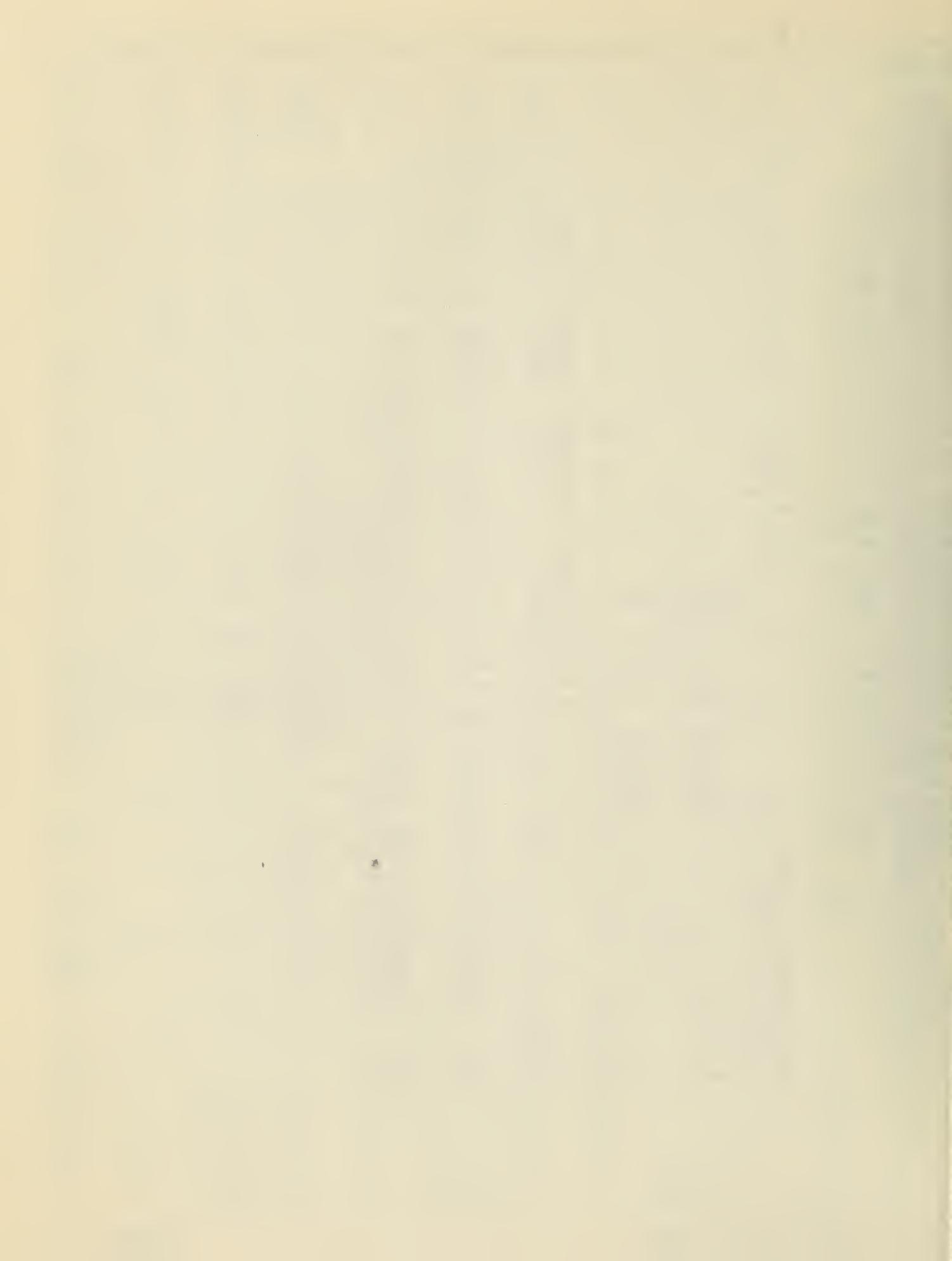
1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published
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25146 14	25146 14	25143 14	26570 41	26510 41	26510 41	26733 11	26437 11	26437 00	26793 00	26496 00	26496 00
25146 22	25146 22	25143 22	26570 51	26510 51	26510 51	26733 12	26437 12	26437 00	26794 00	26460 00	26460 11 26460 19
25146 24	25146 24	25143 24	26570 61	26510 61	26510 61	26741 11	26434 11	26434 11	26795 11	26497 11	26497 11
25146 98	25146 98	25143 98	26570 71	26510 71	26510 71	26741 12	26434 12	26434 12	26795 22	26497 22	26497 21
25147 33	25147 33	25144 33	26570 81	26510 81	26510 81	26741 13	26434 13	26434 13	26795 23	26497 23	26497 21
25147 37	25147 37	25144 37	26570 84	26544 84	26544 10 pt	26741 15	26434 15	26434 15	26795 31	26497 31	26497 31
25147 55	25147 55	25144 55	26570 86	26544 86	26544 12	26742 11	26438 11	26438 11	26795 35	26497 35	26497 35
25147 71	25147 71	25144 71	26570 88	26544 88	26544 14	26742 12	26438 12	26438 12	26795 41	26497 41	26497 41
25147 75	25147 75	25144 75	26570 90	26544 90	26544 10 pt 26544 16	26751 00	26453 00	26453 00	26795 45	26497 45	26497 45
25147 82	25147 82	25144 92	26570 95	26510 95	26510 95	26752 61	26454 61	26454 61	26795 48	26497 48	26497 48
25147 83	25147 83	25144 93	26570 96	26510 96	26510 97 pt	26752 71	26454 71	26454 71	26795 51	26497 51	26497 51
25147 85	25147 85	25144 94	26570 99	26510 99		26752 97	26454 97	26454 97	26795 55	26497 55	26497 55
25147 87						26711 00	26415 00	26415 00	26795 61	26497 61	26497 61
25147 91	25147 91	25144 97 pt	26711 11	26415 11		26753 00	26455 00	26455 00	26795 69	26497 69	26497 69
25147 99	25147 99	25144 91 25144 97 pt	26711 15	26415 15		26761 14	26471 14	26471 14	27213 24	27213 24	27213 21 pt
25152 65	25152 65	25152 67 25152 69	26712 11	26416 11	26416 11	26761 51	26471 51	26471 51	27213 28	27213 28	27213 29 pt
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25190 33	25190 33	25190 32	26713 18	26419 18	26419 12	26764 11	26474 11	26474 11	27213 34	27213 34	27213 31 pt
25190 35			26713 21	26419 21		26764 25	26474 25	26474 25	27213 38	27213 38	27213 39 pt
25312 13	25312 13	25312 11	26714 11	2641A 11	2641A 11	26764 27	26474 27	26474 27	27213 40	27213 40	
25312 15			26714 12	2641A 12	2641A 12	26764 33	26474 33	26474 33	27213 42	27213 42	27213 31 pt 27213 33 27213 39 pt
25312 33	25312 33	25312 31	26714 13	2641A 13	2641A 13	26764 35	26474 35	26474 35	27213 44	27213 44	27213 41 pt 27213 45 pt
25312 35			26714 14	2641A 14	2641A 14	26764 37	26474 37	26474 37	27213 46	27213 46	27213 41 pt 27213 45 pt
25312 43	25312 43	25312 41	26714 15	2641A 15	2641A 15	26764 41	26474 41	26474 41	27213 46	27213 46	27213 41 pt 27213 45 pt
25312 45	25312 45		26714 45	2641B 45	2641B 45	26764 43	26474 43	26474 43	27214 24	27214 24	27214 21 pt
25312 47	25312 47		26714 45	2641B 45	2641B 45	26764 45	26474 45	26474 45	27214 28	27214 28	27214 29 pt
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25991 00	25991 00	25990 21	26721 13	26411 13	26411 13	26764 55	26474 55	26474 55	27214 32	27214 32	27214 21 pt 27214 23 27214 29 pt
25992 31	25992 31	25990 41	26721 53	26411 53	26411 53	26764 71	26474 71	26474 71	27214 38	27214 38	27214 39 pt
25992 33			26722 00	26413 00	26413 00	26764 76	26474 76	26474 76	27214 42	27214 42	27214 31 pt 27214 33 27214 39 pt
25992 35	25992 35	25990 45	26723 00	26414 00	26414 00	26764 77	26474 77	26474 77	27214 44	27214 44	27214 41 pt 27214 45 pt
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25992 47	25992 47	25990 47	26724 45	2641B 45	2641B 45	26764 88	26474 88	26474 88	27214 46	27214 46	27214 21 pt
25992 48	25992 48	25990 48	26724 51	2641B 51	2641B 51	26764 99	26474 99	26474 99	27214 48	27214 48	27214 23 27214 29 pt
25994 51	25993 51	25990 51	26724 53	2641B 53	2641B 53	26764 99	26474 99	26474 99	27214 50	27214 50	
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26530 14	26530 14	26530 29	26724 59	2641B 59	2641B 11 2641B 21 2641B 98 pt	26781 00	26481 00	26481 00	27214 56	27214 56	
26561 00	26541 00	26541 00	26731 00	26435 00	26435 00	26782 00	26482 00	26482 00	27214 58	27214 58	
26562 33	26542 33	26542 33	26732 11	26436 11	26436 11	26791 21	26493 21	26493 21	27214 60	27214 60	
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1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published
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27592 19	2751B 19	27512 18 pt	27597 38	2751G 38		28162 30	28162 30	28162 98	28352 10	2831A 31	2831A 31
			27598 11	2751H 11	27519 17 pt	28162 40	28162 40		28352 15	2831A 51	2831A 32 2831A 33
			27598 13	2751H 13		28162 50	28162 50	28162 60	28352 20	2831A 61	2831A 35 2831A 36 2831A 37
			27598 19	2751H 19	27519 23	28162 60	28162 60		28352 25	2831A 39	2831A 39

[Based on revisions to the Standard Industrial Classification (SIC) Manual, definitions of some product codes were revised for 1987. Listed below are the revisions to the product codes. The terms published and collected are defined as follows: (1) published refers to the code used in the published reports for 1987 and 1982, and (2) collected refers to the code appearing on the report forms for 1987]

1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published	1987 published	1987 collected	1982 published
28361 15	28311 15	28311 15	28511 00—Con.	28511 00—Con.	28511 11—Con.	28750 20	28750 20	28750 11 pt 28750 21 pt
28361 20	28311 20	28311 13 28311 17 28311 19			28511 85 28511 89 28511 93	28750 30	28750 30	28750 31 pt
28362 10	28312 10	28312 00	28512 00	28512 00	28512 21 28512 23 28512 25 28512 27 28512 31 28512 33 28512 35 28512 37 28512 39 28512 41	28750 40	28750 40	28750 11 pt 28750 21 pt
28362 20	28312 20				28750 50	28750 50	28750 31 pt	
28363 10	28313 10	28317 15			28750 60	28750 60	28750 11 pt 28750 21 pt	
28363 20	28313 20	28317 25			28750 70	28750 70	28750 31 pt	
28364 10	28314 10	28318 14			28797 51	28797 51	28797 31 28797 81	
28364 15	28314 15				28798 30	28798 30	28798 81	
28364 20	28314 20	28318 16			28798 83	28798 83		
28364 25	28314 25				28914 57	28914 57	28914 89	
28364 30	28314 30	28319 00			28914 98	28914 98		
28411 43	28411 43	28411 42 28411 44			28916 10	28916 10	28915 56 pt	
28411 62	28411 62	28411 61 28411 63			28916 20	28916 20	28915 61 pt	
28412 18	28412 18	28412 05 28412 19	28513 00	28513 00	28513 01 28513 05 28513 07 28513 11 28513 13 28513 16 28513 27 28513 29 28513 31	28916 30	28916 30	28915 63 pt
28413 97	28413 97	28413 51 28413 61 28413 95			28916 40	28916 40	28915 65 pt	
28423 53	28423 53	28423 99			28916 50	28916 50	28915 67 pt	
28423 95	28423 95				28917 11	28917 11	28915 54	
28441 49	28441 49	28441 37 28441 39	28515 00	28515 00	28515 21 28515 22 28515 23 28515 31 28515 32 28515 99	28917 21	28917 21	28915 55
28443 25	28443 25	28443 98			28917 31	28917 31	28915 56 pt	
28443 27	28443 27		28611 98	28611 98	28611 13 28611 23 28611 99	28917 41	28917 41	28915 61 pt
28443 95	28443 95				28917 51	28917 51	28915 63 pt	
28444 71	28444 71	28444 73 28444 75			28917 61	28917 61	28915 65 pt	
28445 02	28445 02	28445 11			28917 71	28917 71	28915 67 pt	
28445 03	28445 03	28445 12			28920 39	28920 39	28920 35 28920 37	
28445 04	28445 04	28445 13			28920 57	28920 57	28920 53 28920 55	
28445 05	28445 05	28445 14						
28445 08	28445 08	28445 15	28691 32	2911B 32	2911B 32			
28445 09	28445 09		28691 33	2911B 33	2911B 33	28995 25 28995 26	28995 25 28995 26	28995 29
28445 50	28445 50	28445 45 28445 48			28995 40 28995 42 28995 45	28995 40 28995 42 28995 45	28995 37	
28445 59	28445 59	28445 95	28445 99		28995 69 28995 70 28995 71	28995 69 28995 70 28995 71	28995 68	
28445 99	28445 99				28995 82 28995 83 28995 84	28995 82 28995 83 28995 84	28995 81	
28511 00	28511 00	28511 11 28511 21 28511 22 28511 24 28511 25 28511 35 28511 37 28511 38 28511 43 28511 45 28511 47 28511 49 28511 53 28511 57 28511 59 28511 63 28511 65 28511 69 28511 71 28511 73 28511 75 28511 77 28511 81 28511 83	28742 00	28742 00	28742 00 28742 10 28742 71	28995 98 28995 99	28995 98 28995 99	28995 97
		28744 10	28744 10	28744 21 pt 28744 31 pt	28744 20	28744 11 pt 28744 21 pt	28995 88 28995 89	28995 88 28995 89
		28744 30	28744 30	28744 31 pt	28744 40	28744 11 pt 28744 21 pt	28995 94 28995 96	28995 94 28995 96
		28744 40	28744 40		28744 50	28744 31 pt	28995 98 28995 99	28995 98 28995 99
		28744 50	28744 50		28744 60	28744 60	28744 11 pt 28744 21 pt	2911B 59 2911B 54 2911B 58
		28744 70	28744 70	28744 31 pt	28744 70	28744 70	28744 31 pt	2911D 23 2911D 25
		28750 10	28750 10	28750 21 pt 28750 31 pt	29521 13	29521 13	29521 11	



PUBLICATION PROGRAM

1987 CENSUS OF MANUFACTURES

Publications of the 1987 Census of Manufactures, containing preliminary and final data on manufacturing establishments in the United States, are described below. Publications order forms for the specific reports may be obtained from any Department of Commerce district office or from Data User Services Division, Customer Services (Publications), Bureau of the Census, Washington, DC 20233.

Preliminary Reports

Industry series—83 reports (MC87-I-20A(P) to -39D(P))

Preliminary industry data are issued in 83 separate reports covering 459 industries. Preliminary summary data for the U.S. and States are released in one report.

Final Reports

Industry series—83 reports (MC87-1-20A to -39D)

Each of the 83 reports provides information for a group of related industries ("dairy products" includes industries for butter, cheese, milk, etc.). Final figures for the United States are shown for each of the 459 manufacturing industries on quantity and value of products shipped and materials consumed, cost of fuels and electric energy, capital expenditures, assets, rents, inventories, employment, payroll, payroll supplements, hours worked, value added by manufacture, number of establishments, and number of companies. Comparative statistics for earlier years are provided where available.

For each industry, data on value of shipments, value added by manufacture, capital expenditures, employment, and payroll are shown by employment-size class of establishment, State, and degree of primary product specialization.

Geographic area series—51 reports (MC87-A-1 to -51)

A separate report is being published for each State and the District of Columbia. Each report presents data for industry groups and industries on value of shipments, cost of materials, value added by manufacture, employment, payroll, hours worked, new capital expenditures, and number of manufacturing establishments for the State, MSA's, counties, and selected places. Comparative statistics for earlier census years are shown for the State and large MSA's. Manufacturing totals are presented for each county and for places with significant manufacturing activity. Detailed statistics (including inventories, assets, rents, and energy costs) are presented only in statewide totals.

Subject series—7 reports (MC87-S-1 to -7)

Each of the seven reports contains detailed statistics for an individual subject, such as concentration ratios in manufacturing, type of organization, water use in manufacturing, textile machinery in place, distribution of sales by class of customer, manufacturers' shipments to the Federal Government, and a general national-level summary.

Reference series—1 report (MC87-R-1)

The Numerical List of Manufactured and Mineral Products includes a description of the principal products and services published in the 1987 Censuses of Manufactures and Mineral Industries.

Location of Manufacturing Plants—1 report (MC87-LM)

This report includes data for number of establishments by four-digit SIC industry and by employment-size class for counties, incorporated places of 2,500 inhabitants or more, and zip codes for each State. (This report is available only on magnetic tape and CD-ROM.)

Analytical Reports—3 reports (AR87-1 to -3)

Exports From Manufacturing Establishments (AR87-1)

This report presents data on exports by two- and three-digit SIC industry groups for the United States and States. Information is presented on value of direct report shipments and estimates of the employment required to manufacture these products. Included are estimates of employment in manufacturing and nonmanufacturing establishments that supply parts, materials, and services for production of manufactured exports.

Selected Characteristics of Manufacturing Establishments That Export (AR87-2)

This report presents data on the number of manufacturing companies and establishments that export by major group, State, employment size, and ratios of exports to shipments.

Indexes of Production (AR87-3)

The indexes presented in this report are designed to measure the change in physical output of each manufacturing and mineral industry between 1982 and 1987.

MICROFICHE

Every final published report in the 1987 Census of Manufactures will be available on microfiche.

PUBLIC-USE COMPUTER TAPES AND COMPACT DISCS

Data from the final industry series, geographic area series, and the Location of Manufacturing Plants report will be available on public-use computer tapes and compact discs-read only memory (CD-ROM). These tapes will provide the same information found in the final reports. Computerized data products are available for users who wish to summarize, rearrange, or process large amounts of data. These products, with corresponding technical documentation, are sold by Data User Services Division, Customer Services (Tapes), Bureau of the Census, Washington, DC 20233.

OTHER ECONOMIC CENSUSES REPORTS

Data on retail trade, wholesale trade, service industries, construction industries, mineral industries, transportation, enterprise statistics, minority-owned businesses, and women-owned businesses also are available from the 1987 Economic Censuses. A separate series of reports covers the censuses of outlying areas—Puerto Rico, Virgin Islands of the United States, Guam, and the Northern Mariana Islands. Separate announcements describing these reports are available free of charge from Data User Services Division, Customer Services (Publications), Bureau of the Census, Washington, DC 20233.

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